AN INFORMATION INTEGRATION APPROACH TO TESTING A DECISION MODEL OF SELF-PRESENTATION

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To my husband, Charles,

and my parents, Dr. and Mrs. Jack T. McCown,

for their encouragement and support.

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This study tested a decision model of how people integrate information about the expected outcomes of self-presentations to arrive at an overall evaluation of the expected value of making specific self-presentations (R). A relative weight averaging model of the form, $R = PA + (1 - P)B$, was proposed. According to this modified subjective expected utility formulation, the expected values of a successful self-presentation (A) and an unsuccessful self-presentation (B) are weighted by the probability of a successful and unsuccessful self-presentation, P and $(1 - P)$, respectively, to arrive at R.

The model predicts that the probabilities should combine multiplicatively with the expected values, i.e., P multiplies A and $1 - P$ multiplies B. Furthermore, the effects of A and B should be additive when averaged over levels of P.

On the basis of information contained in descriptive job promotion scenarios, subjects made ratings of the likelihood that they would

emphasize the characteristics favored by the interviewer at the job promotion interview. The descriptive information contained in each scenario corresponded to the components of the model (A, P and B). Each component was manipulated as a factor in a repeated measures factorial experiment.

The results indicated that the components of the model did influence the likelihood of making the specific self-presentation. The pattern of the data suggested weak multiplicative trends for PA and (1 - P)B, and provided some qualitative support for the relative weighting scheme. However, according to a stingent quantitative model analysis based on the information integration approach and functional measurement, the model did not pass the test of fit. The results further suggested that the model should be revised to allow for differential weighting of negative and/or extreme outcomes.

It was suggested that the failure to obtain strong evidence for the predicted multiplicative effects could be the result of processing limitations stemming from the complexity of the stimulus information.

TABLE OF CONTENTS

Page

CHAPTER I
INTRODUCTION

Social interaction involves the conveyance of information about how participants view themselves and their situation, and how they desire others to see and treat them. Although there are times when presentations of self are deliberately communicated to enhance a participant's position in an interaction, and hence a choice between alternative types of self-presentation is required, much self-presentational behavior is not exploitative or deceitful. Self-presentation often involves bringing to others' attention one's real accomplishments, beliefs and values, or projecting different facets of oneself that are especially appropriate to the situation. Alternatively, it may represent well-ingrained, habitual responses triggered by relevant social cues. However, even habitual self-presentational behavior may have at one time required conscious decisions about how to behave to project specific images. In order to better understand interpersonal behavior, it is important to explain how decisions about self-presentations are made.

Despite the importance of the area, relatively little attention has been paid to conceptualizing the process underlying individual decisions about self-presentations. The purpose of the present research was to test a decision model of self-presentational behavior. The model is based on a modified subjective expected utility formulation and may be used to better understand interpersonal behavior.

Conceptualization, Empirical Evidence and Definition

Self-presentation is an integral part of social interaction. It involves controlling the images of oneself that are expressed to real or imagined audiences (Goffman, 1959; Schlenker, 1980; Note 1). Through their appearance and behavior people consciously or nonconsciously claim particular images comprising their identities. One's identity may be thought of as a theory that is constructed about how one is and should be perceived, regarded and treated in social life (Schlenker, 1980; in press). Basically, it is an organization of knowledge about oneself in social situations and relationships. Identities are comprised of numerous images which form schemas (i.e., mental pictures, categorizations) of the individual that are relevant to specific situations, audiences and behaviors.

The identity-relevant images that people project influence the impressions others draw of them. Furthermore, they help to define participants' roles in an interaction, thereby influencing the types of behaviors that are appropriate and inappropriate. The images that are engaged usually imply behavioral prototypes that guide subsequent behavior (Schlenker, 1980; Note 1; in press). For example, behaviors associated with a competitive image would differ in obvious ways from those associated with a compliant image.

While people generally desire to project favorable identity-relevant images, the particular images that are projected depend on the specific goals of the actor. According to Goffman (1959), an actor may desire others "to think highly of him, or to think he thinks highly of them, or to perceive how in fact he feels toward them, or to obtain no clear-cut impression; he may wish to ensure sufficient harmony so that the

interaction can be sustained, or to defraud, get rid of, confuse, mislead, antagonize, or insult them" (p. 3). A more recent analysis (Jones & Pittman, 1980) has suggested that people may be motivated to have others (a) like them (ingratiation), (b) think them competent (self-promotion), (c) think them morally worthy (exemplification), (d) fear them (intimidation) or (e) feel sorry for them (supplication).

Regardless of actors' specific goals, it is usually to their advantage to control the images they project (Goffman, 1959; Jones & Pittman, 1980; Jones & Wortman, 1973; Schlenker, 1980). Projected images that are appropriate to the situation and make the desired impression often result in desired reactions from others and positively valued outcomes (e.g., social approval, respect, friendship, material rewards or self-satisfaction). However, images that are judged as inappropriate and make undesired impressions may result in undesired reactions and negatively valued outcomes (e.g., disapproval, punishment or self-dissatisfaction). Thus, the interdependent nature of social interaction makes it desirable for people to control their identities in order to influence their social outcomes and maximize their reward/cost ratios in social life (Schlenker, 1980).

Research in the area of self-presentation has suggested that people systematically vary their self-presentations to maintain and create desirable identity-relevant images and/or to avoid undesirable ones (Schlenker, 1980; Tedeschi, 1981). In some situations actors become more conforming, other-enhancing and/or self-enhancing to increase their attractiveness to a target person (Jones, 1964; Jones & Wortman, 1973). For example, subjects have been found to describe themselves as more task competent to someone with power over them than to someone without such

power, particularly when the powerful target is unaware of his/her power (Stires & Jones, 1969) or is open to influence (Jones, Gergen, Gumpert & Thibaut, 1965).

In other circumstances modesty is likely to be used as an effective self-presentational strategy, particularly if a self-enhancing self-presentation could be refuted by past/present/future behaviors (Bradley, 1978; Jones & Wortman, 1973; Schlenker, 1975, 1980). Sometimes a mixture of modesty and self-enhancement is the preferred strategy. For example, subjects who have failed at a task have attempted to compensate for their poor performance by becoming self-enhancing, but only on characteristics not specific to the poor performance (Baumeister & Jones, 1978).

Thus, numerous studies have empirically demonstrated that self-presentations are systematically affected by personal and situational factors relevant to an interaction. Despite the abundance of research in the area, researchers have not always agreed about what behaviors should be considered as self-presentational. One perspective is that self-presentation includes any behavior that has the potential to convey information about an actor whether or not the actor intended to convey a certain impression or was consciously aware it was conveyed (e.g., Goffman, 1959). An alternative view is that the actor must be aware of and intend to create a specific impression (e.g., Snyder, 1977). According to the present perspective, self-presentational behaviors are intentional (goal directed), but do not necessarily involve conscious planning.

Schlenker (1980) has defined self-presentation as the conscious or nonconscious attempt to control self-relevant images before real or

imagined audiences. According to this position, self-presentation is a goal directed act for which the immediate goal is to create a particular image of the self for real or imagined others. Self-presentation is, therefore, a form of social influence through which people attempt to control the impressions and reactions of others.

Although most behavior conveys information about a person, not all social behavior is self-presentational. For a behavior to be a self-presentation, an actor must have attempted to control how others would perceive the self in order to influence their impressions and reactions. Moreover, the intended impression-relevant reactions of others (perceived or anticipated) are the criteria for evaluating the effectiveness of a self-presentation. Therefore, self-presentational behavior usually has evaluative implications. This is reflected in the definition by the phrase self-relevant images, since an image "affects the way a person is evaluated, how one has behaved, will behave and should behave and how one is treated in social interaction" (Schlenker, 1980, p. 95). The inclusion of imagined others in the definition reflects the influence of symbolic interactionism. From a symbolic interactionist standpoint, the self-concept develops from social interaction; it is sustained and changed by social interaction and reflects the internalization of social standards. Thus, even when a person is not in the immediate presence of others, their existence affects the person's behavior. From this perspective it would be inconsistent to view all self-presentation as a totally public phenomenon.

Although self-presentational behavior is goal directed, it does not necessarily have to involve conscious planning. Self-presentations can

reflect well-learned responses that are triggered by relevant social cues but are performed without conscious awareness of their social function. This allows conscious attention and effort to be focused on other important activities. However, at some point in the development of the response sequence, the actions may have been aimed at projecting specific images and influencing real or imagined others to adopt a particular view of oneself. While people maintain a large repertoire of habitual response patterns, there are many occasions when conscious decisions are necessary about how to present oneself.

A Decision Model

Schlenker (1980; Note 1) has developed a decision model of how people integrate information about the expected outcomes of self-presentations to arrive at an overall evaluation of the desirability of claiming a specific image. In making this judgment, an actor independently assesses the expected value of what would happen if the image is successfully claimed (i.e., it is accepted by his/her audience as descriptively accurate) and the expected value of what would happen if the image is unsuccessfully claimed (i.e., it is not accepted as accurate and, therefore, creates an unintended and/or undesired impression). These expected values (which will be referred to as A and B, respectively) form the major components of the decision model.

The A component determines the attractiveness (the expected value) of the image if the claim is successful. It consists of the subjective values of the consequences that appear to be associated with successfully claiming the image and the subjective probabilities that these consequences will occur. More precisely, the expected value of a

successful image claim is the value of each consequence multiplied by the subjective probability that it will occur if the image is successfully claimed. Such products are determined for all salient consequences associated with the successful claim. These products then combine in an additive fashion.

As an example of the process which determines the attractiveness of a claim, suppose that Cindy wants to be viewed as highly motivated by her supervisor. She believes that if her supervisor views her as highly motivated, she will have a 70% chance to get the promotion/raise she wants (a consequence she values very positively), a 90% chance her supervisor will respect her (a consequence she values somewhat positively), and a 30% chance her supervisor will overload her with more work (a consequence she values somewhat negatively). Despite the presence of a negatively valued consequence (i.e., being overloaded with work), the expected value of appearing highly motivated would still be high. Thus, she might try to influence her supervisor's impression of her motivation by taking work home to complete and taking short lunch breaks.

Claiming the most desirable images does not necessarily imply that people choose the most attractive ones. In determining the overall desirability of claiming an image, reality acts as a constraint on self-presentations (Schlenker, 1975, 1980). Actors must consider the facts of the situation and whether or not their audience will perceive the image as accurate.

If actors' claims to attractive images are challenged by others and they cannot provide adequate supportive evidence or a satisfactory explanation for their claims, negative repercussions may occur. They may feel embarrassed or guilty, be ridiculed, be perceived as untrustworthy,

etc. For example, the college freshman who boasts of his intelligence should get a good score on an easy test, or be prepared to be ridiculed. Thus, inaccurate and repudiated claims can lead to internal and/or external punishments.

When deciding how to present oneself, actors must also take into account what would happen if the image were claimed, but repudiated. Component B represents the expected value of the image if it is unsuccessfully claimed. It consists of the (usually negative) consequences that are associated with claiming the image and the subjective probability that these consequences would occur if the claim were unsuccessful. Again, the subjective value of each consequence is assumed to combine multiplicatively with the subjective probability that it will occur. Such products are formed for all salient consequences for an unsuccessful claim and then additively combined.

Once the expected values of the two components (i.e., A, the expected value of a successful claim, and B, the expected value of an unsuccessful claim) are evaluated, the relative probabilities of a successful versus unsuccessful claim are determined. Schlenker (1980) has proposed that the overall evaluation of the desirability of claiming an image is the weighted average of A and B. The perceived probability of a successful claim (P) and the perceived probability of an unsuccessful claim (P') are the relative weights of the A and B components, respectively. It is assumed that the probabilities, P and P', sum to one (i.e., $P' = 1 - P$) since the probability of a successful claim would logically range from 0% to 100%.

According to Schlenker (1980), people's self-presentations (and self-beliefs) reflect choices of the most desirable images from amongst

sets of mutually exclusive alternative images. In general, people want to maximize their association with desirable images and minimize their association with undesirable images. Therefore, when people confront a self-presentational decision, they contemplate the overall desirability of claiming relevant images and then choose the most desirable.

The model which describes the judgment process is a relative weight averaging model. The model predicts that the effect of component A (the expected value of a successful claim) varies directly with P (the perceived probability that the claim will be successful) and inversely with 1 - P (the perceived probability that the claim will be unsuccessful). The model can be written as follows:

$$R = P\,A + (1 - P)\,B \tag{1}$$

where R is the judged overall expected value (desirability) of claiming a particular image; P and 1 - P are the subjective probabilities of a successful and unsuccessful claim, respectively; A and B are the expected values of a successful and unsuccessful claim, respectively.

Although the model reduces to a simple additive form (i.e., where A is multiplied by P and B is multiplied by 1 - P and these products are summed), it is not a strict adding model. Psychologically, adding and averaging imply different processes. In a strict adding model, any informational stimulus is completely independent of other stimuli. Mathematically, this implies that a strict adding model imposes no constraints on the weight parameters. However, an averaging model always implies some degree of cognitive interaction because the weight of any one stimulus is inherently dependent on all the others. Therefore, the present model assumes an averaging rather than an adding process since the probability of a successful claim (P) and the probability of an

unsuccessful claim (P') sum to one. Any change in the value of P necessarily implies a change in the value of P'.

In terms of the proposed model, the overall value of a claim to an image is the expected value of what the person believes would happen by acting to claim the image. It is expected that the overall value of claiming the image, and therefore the likelihood that a person would act to claim it, would increase if the following changes in the value of any one of the model's components occur (while holding the values of the other components constant). These changes include (a) an increase in the expected value of a successful claim (e.g., the actor believes the image will impress an audience), (b) an increase in the probability of a successful claim (e.g., there is no evidence to contradict the claim) and (c) a decrease in the expected value of an unsuccessful claim (e.g., the actor believes the audience is kind and accepting).

To date, no studies have specifically tested the proposed model, but let us briefly consider how the present formulation could possibly aid us in understanding self-presentational behavior. Take for example the literature on self-serving attributions. Research has indicated that people generally accept responsibility for positive behaviorial outcomes and deny responsibility for negative behavioral outcomes (Bradley, 1978; Snyder, Stephan & Rosenfield, 1976). According to the model, a claim to some amount of responsibility for an outcome should be affected by the expected value of a successful claim for that amount of responsibility, the probability that the claim will be successful, and the expected value of an unsuccessful claim. Any factors affecting these components should affect the amount of responsibility a person claims for a particular outcome.

One factor that has been found to affect self-enhancing attributions is the importance of a task to a person's identity. In terms of the model, task importance should affect the expected value of a successful self-enhancing claim. As the importance of the task increases, so should the tendency to engage in self-enhancing attributional patterns. Indeed, research has found that people who succeed at a task attribute their performance more to personal effort and ability (self-enhancing images) and less to luck and test difficulty (self-deflating images). Moreover, these effects are more pronounced under the high importance condition than the low importance condition (Miller, 1976).

High versus low need for achievement is another factor that has been shown to affect self-enhancing self-presentations. Low need-achievers tend to display less egotistical attributional patterns following success on a task than high need-achievers (see Weiner, Frieze, Kukla, Reed, Rest & Rosenbaum, 1971). According to the model, need for achievement should also affect self-presentations by affecting the expected value of a successful self-enhancing claim (component A). Low need-achievers would be expected to value a self-enhancing image less than high need-achievers. Therefore, they would be less likely to claim this image since its overall expected value would be low.

Although people generally desire to be seen in positive ways, they do not always claim the most attractive images possible. As previously mentioned, reality acts as a constraint to define a range of believable claims. The facts of the situation put limitations on the amount of responsibility people can claim for positive outcomes. Therefore, individuals may not want to claim undue credit for positive outcomes and deny credit for negative ones if unrealistic positive self-presentations

(i.e., egotistical attributions) could be invalidated by their own past/subsequent behavior or by others'present/future knowledge of their behavior (Bradley, 1978; Schlenker, 1975, 1980). Such factors would be expected to decrease the perceived probability of a successful self-enhancing claim, thereby lowering the overall value of claiming the image.

Audience characteristics such as the degree of warmth and supportiveness have also been found to affect self-enhancing attributions. In terms of the model, such audience characteristics should affect the expected value of an unsuccessful self-enhancing claim. Self-aggrandizement should be greater given a warm, supportive audience than if the audience is cold and critical (Ackerman & Schlenker, Note 2).

The previous discussion has shown how the model may be useful for understanding both self-serving and self-deflating image claims. While actors generally try to associate themselves with positive images (i.e., images with high expected values), a modest claim may be perceived as having a higher overall expected value since it may have a better chance to be believed and result in less negative sanctions than an overly positive claim.

A cursory look at one research area suggests that several of the variables empirically demonstrated to affect self-presentations may do so by affecting components in the proposed model. According to the conceptualization, personal and situational factors affect judgments and self-presentations through their influence on the probabilities, expected values or the salience of the anticipated consequences of the behavior. This analysis is admittedly post hoc and the model needs to be evaluated much more rigorously to determine its usefulness in analyzing self-presentational behavior.

Comparison of Schlenker's Model to Subjective Expected Utility Formulations

Schlenker's approach is similar to that taken by subjective expected utility (SEU) theorists (e.g., Edwards, 1961; Savage, 1954). People are assumed to always try to select the behavioral alternative whose consequences give them the greatest expected utility.

The basic SEU model assumes the decision maker combines information (i.e., subjective probabilities and utilities) for all the salient consequences of making a given choice, and then forms an impression of the subjective expected utility of that choice. Presumably, all the salient alternatives are evaluated and then the one with the greatest SEU is chosen. The general formulation of a subjective expected utility model is as follows:

$$SEU = \Sigma \ (p_i u_i)$$

where u_i is the expected utility (evaluation) of the i^{th} consequence, p_i is the subjected probability that the i^{th} consequence will result from the behavior and the summation is over all salient consequences. Specifically, the model implies that the subjective probability (that a behavior will produce consequence i) multiplies the utility (of consequence i) to determine the overall impact on the evaluation. Furthermore, the products associated with different consequences combine additively to arrive at an overall evaluation of the behavior. The additivity assumption implies that the effect of any given piece of information is independent of the other information available.

Schlenker (1980) has proposed that the A and B components are each determined by separate SEU formulations. The subjective value of each salient consequence associated with a successful claim is multiplied by

the subjective probability that it will occur (given a successful claim). These products are then combined additively, thereby determining the A component. The B component is formed from similar products, except the expected values and probabilities are those associated with an unsuccessful claim.

As stated previously, the molar form of Schlenker's model further proposes that the A and B components are weighted by the probability that the image claim will be successful and the probability that the claim will be unsuccessful, respectively, and averaged to determine the overall evaluation (expected value) of claiming an image.

While the molar form of Schlenker's model is the concern of the present research, it should be noted that the assumption of the SEU formulation (i.e., that $p_i u_i$ products combine additively) has been repeatedly challenged. Much evidence suggests that an averaging rather than an adding process occurs (Anderson & Shanteau, 1970; Birnbaum, 1974a; Lynch, 1979; Lynch and Cohen, 1978; Shanteau, 1974).

For example, Lynch & Cohen (1978) proposed a modified SEU formulation as a model for understanding helping behavior. Findings of one experiment supported the contention that the probability (p_i) and utility (u_i) of a specific consequence combine multiplicatively. However, results of a second experiment failed to support the assumption that the p X u products for different consequences combine additively. Instead, the results suggested that differential-weight product averaging provided a more accurate descriptive model. More specifically, an averaging model was proposed in which the weight of each $p_i u_i$ product varied positively as a function of its extremity and/or its negativity.

The previous finding has possible implications for the form of the proposed model. It suggests that the A and B components could have separate weights in addition to the relative weighting implied by the probability component. For example, if the B component (i.e., the expected value of an unsuccessful claim) was extremely negative, then this component might receive extra attention (weight) in determining the overall value of claiming the image, a weighting beyond that implied by its probability of occurring. Such an effect might be evidenced by an unpredicted interaction between the A and B components.

Schlenker's model (Equation 1) provides a conceptual scheme of the process that underlies judgments influencing image claims and self-presentation. To test the functional implications of Schlenker's model, the proposed research employed the information integration paradigm and functional measurement (Anderson, 1962, 1970, 1974a, 1974b, 1974c, 1981, 1982) which have been widely used to study information integration.

The Information Integration Paradigm

Many investigators in the area of evaluative judgments and decision-making have taken the viewpoint that stimulus integration is pervasive in human behavior, and that most judgments are the result of the integration of multiple stimuli. One implication arising from research in the area of information integration is that many judgmental tasks appear to follow simple algebraic rules. People frequently appear to be averaging, subtracting or multiplying stimulus information to arrive at a response. Experimental and social psychologists, using the information integration paradigm developed by Anderson (1962, 1970, 1974a, 1974b, 1974c) and

Birnbaum (1973, 1974a, 1974b), have provided an empirical foundation for the approach. Research on such diverse topics as evaluation of gambles (Anderson & Shanteau, 1970; Lynch, 1979; Shanteau, 1974), personality impression formation (Anderson, 1974b; Birnbaum, 1974a) and helping behavior (Lynch & Cohen, 1978) has employed algebraic models of information processing based on the information integration paradigm and has suggested that they may provide theoretically useful "paramorphic representations" (Hoffman, 1960) of information processing (i.e., models can replicate stimulus-response relations without guaranteeing that they represent the true underlying process). Moreover, the development of a methodology that can reveal the operation of algebraic rules describing subjects' responses is one of the major contributions of the information integration approach.

The information integration paradigm provides a unified, general approach to judgment. According to this paradigm, informational stimuli, S_i and S_j (i.e., physical or symbolic stimuli) are each encoded into their subjective values, s_i and s_j. These subjective values are then combined by some (algebraic) integration function, I, to form an overall subjective evaluation, r (i.e., $r = I[s_i, s_j]$). The overt response, R (e.g., an evaluative rating of the desirability of claiming an image), is assumed to be related to the subjective evaluation, r, by a judgment function, i.e., $R = J(r)$. (See Figure 1.)

According to the information integration paradigm, values are not inherent, fixed properties of stimuli, but result from a constructive valuation process. Stimulus valuation depends upon the specific goals of an individual and on an aggregate of background knowledge. Thus, the expected values associated with successful and unsuccessful image claims

Information Integration Paradigm

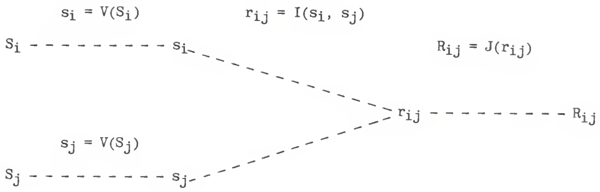

FIGURE 1. The information integration diagram. A chain of three linked functions (V, I and J) lead from the observable stimuli, S_i and S_j, to the overt response, R_{ij}. The observable stimuli are each encoded by a valuation function, V, into their subjective values, s_i and s_j. The subjective stimuli are then combined by some algebraic integration function, I, to form an overall psychological impression, r_{ij}. The overt response, R_{ij}, is related to the integrated psychological impression, r_{ij}, by a judgment function, J. This figure was adapted from similar figures appearing in Anderson (1981), Birnbaum (1974a) and Lynch (1979).

are idiosyncratic. People's personalities interact with the situation to affect which consequences are perceived as associated with certain images and the values of those consequences.

Birnbaum (1974a) has noted that there are three problems associated with the use of the information integration paradigm. These are (a) finding the subjective values s_i and s_j, (b) testing the integration function, i.e., testing the model $r_{ij} = I(s_i, s_j)$, and (c) finding the judgment function, J, relating the integrated impression, r, to the overt response, R. While the information integration approach (with functional measurement) addresses these issues, the major concern is with examining the validity of the integration function (i.e., testing the model). Estimation of the response function may be necessary, but is of little intrinsic interest. Estimation of the subjective stimulus values is also of secondary interest.

Functional Measurement Methodology

The methodology associated with experimental tests of substantive theories of information integration is functional measurement. The idea behind functional measurement is that substantive theory and measurement are integrally related. The form the integration model is hypothesized to take is based on substantive theory and accumulated empirical evidence. Functional measurement focuses upon the integration model and the necessary properties that a data matrix must have to be consistent with the specified integration model.

Functional measurement differs from traditional correlational approaches to measurement and model analysis. In the usual correlational

approach, separate rating scales are used to measure the independent and dependent variables. The ratings of the independent variables are then combined using the formulation specified by the theoretical model to generate a predicted response. The magnitude of the correlation between the predicted and observed response is then employed as the index of fit for the theoretical model.

The major problem with this approach is that the level of correlation is not only affected by the validity of the algebraic rule, but is also affected by the level of measurement of the independent variables. Another problem is that the correlation coefficient does not distinguish between systematic and unsystematic violations of the model's predictions. It simply measures the degree of agreement between the model and the data. (See Anderson & Shanteau, 1977; Birnbaum, 1973, 1974b; Schmidt, 1973.)

The functional measurement approach does not require a priori scaling assumptions of the independent variables. The validity of the algebraic rule is assessed through statistical tests based on analysis of variance, which permit the separation of random and systematic deviations from predictions of the model.

The main measurement problem in functional measurement is with the response. Sometimes numerical responses are not interval scales of the true subjective response (i.e., the numerical response is not linearly related to the true subjective response), but lie somewhere between being ordinally and intervally related to the subjective response. Raw data can be used for a model analysis only when the overt responses are linearly related to the subjective evaluations. Otherwise, some transformation of the raw data is necessary.

Functional measurement, based on the information integration paradigm, assumes that there is a monotonic judgment function (J) which relates the subjective response to the overt numerical ratings. In order to assess the validity of the integration model when the judgment function is nonlinear, raw responses must be transformed back to the subjective response scale (i.e., the inverse transformation, J^{-1}, is needed). In general, a nonlinear judgment function will make raw data violate an hypothesized integration model, even when the integration function is actually correct. Therefore, functional measurement allows for monotonic transformation of raw data.

There are, however, numerous problems associated with performing monotone rescaling. It is often possible to transform a given set of data to fit a model even though the model is wrong (Anderson, 1982; Birnbaum & Veit, 1974). Justification for transformation depends upon the correctness of the model, which rests on accumulated knowledge. Data which deviate from an hypothesized model should not automatically be attributed to nonlinearities in the rating scale. Deviations from model predictions should be considered seriously, even when they can be eliminated by transformation.

The functional measurement approach is strong in supporting a model when no transformation of the data is required to make the data fit. It is less successful in guiding interpretation of data when the raw data do not fit the model, but can be monotonically transformed to fit. Such data would be interpreted as supporting a model only if the necessary transformation is believed to be J^{-1}, the function that transforms the raw responses back to the true subjective evaluations, i.e., $r = J^{-1}(R)$.

Again, this decision rests upon accumulated knowledge in the substantive area.

Fortunately, rating methods (with suitable precautions) have been shown to be capable of giving interval scales (Anderson, 1974a, 1981). This is evidenced by the success of model analysis using functional measurement with a variety of tasks. When data are found to fit an hypothesized model, it generally provides simultaneous support for the form of the model and for the linear relationship between the implicit and overt response.

Anderson's (1981) extended program of research has suggested certain precautions that are necessary with using rating scales to produce interval scaled data. According to Anderson (1981), it is particularly important to provide subjects with preliminary practice. Since subjects do not initially know the general range of the stimuli and the rating scale is arbitrary, it is necessary for them to develop a frame of reference for the stimuli and correlate it with a given stimulus response framework. Furthermore, the practice stimuli should include extreme stimuli to help anchor the use of the response scale.

Overview of Experiment Using the Information Integration Paradigm to Test the Model

An experiment was conducted to test how stimulus information, corresponding to the components in the model, is integrated to form an overall judgment of the desirability (expected value) of claiming an image. On the basis of information contained in descriptive scenarios, subjects made overall ratings of how likely they would be to present

themselves in a certain way at a job promotion interview. Twenty-seven scenarios were composed by factorially combining information about component A, the expected value of a successful image claim, component B, the expected value of an unsuccessful image claim and component P, the probability of a successful image claim.

According to the information integration paradigm, subjects are assumed to first evaluate the implications of the information in a scenario, P_i, A_j and B_k (where P_i is the stimulus information concerning the perceived probability of a successful claim for the i^{th} level of factor P, A_j is the stimulus information concerning the value of a successful claim for the j^{th} level of factor A, and B_k is the stimulus information concerning the value of an unsuccessful claim for the k^{th} level of factor B) and to assign subjective scale values (p_i, a_j, b_k) to them. Furthermore, the subjective scale values are combined in a manner represented by the integration function, $I(p_i, a_j, b_k)$, to produce an integrated subjective evaluation of the overall desirability of claiming the image, r_{ijk}. This subjective evaluation cannot be observed directly, but can be estimated through subjects' numerical ratings of how likely they would be to claim the image.

The cognitive integration process, I, was assumed to follow the algebraic model

$$r_{ijk} = p_i a_j + (1 - p_i)\, b_k \quad . \qquad (2)$$

Furthermore, the overt response was assumed to be a linear function of the subjective response. Therefore,

$$R_{ijk} = \alpha\, (r_{ijk}) + \beta$$

where α and β are linear coefficients.

Equation 2 can be tested as a multilinear model. In general, multilinear models are defined as a sum of products of several stimulus factors where each factor occurs in each product with exponent zero or one (Anderson, 1974a, 1982). The model of Equation 2 implies a unique pattern of interactions that correspond to the algebraic structure of the model. The observed pattern of interactions provides the diagnostic device to determine whether the observed data fit the proposed model.

As part of the experimental stimuli, subjects were given information pertaining to the probability of a successful claim, P. It was assumed that subjects would infer the probability of an unsuccessful claim, 1 - P, to the complement of P. Since 1 - P is completely determined by P, it should be unnecessary to explicitly manipulate 1 - P as a separate factor in the factorial experiment. Thus, the model may be tested by a factorial experiment where information corresponding to the P, A and B components of the proposed model are conceived to be the factors of the design.

The model of Equation 2 may be equivalently written

$$r_{ijk} = p_i a_j + b_k - p_i b_k \quad . \tag{3}$$

In this form it can more easily be seen how the factorial model relates to the algebraic structure of the proposed model (Equation 2). The factorial model mirrors the algebraic structure of Equation 3 and implies that the P X A and P X B interactions of an analysis of variance should be statistically significant and that all other interactions should be nonsignificant.

The proposed model involves the basic operations of adding and multiplying and is, therefore, a multilinear model. Statistical analysis of multilinear models rests on linear fan analysis and parallelism analysis, which are a part of functional measurement methodology

(Anderson, 1970, 1974a, 1982). Linear fan analysis applies to the factors separated only by multiplication signs; parallelism analysis applies to the factors separated by a plus sign. The corresponding interaction tests from an analysis of variance are applicable and provide the means for diagnosing the underlying integration operations.

Linear Fan Analysis

To illustrate linear fan analysis, consider a three-way factorial design where subjects receive stimulus combinations P_i, A_j and B_k and make a numerical response, R_{ijk}, to each combination. Suppose that $r_{ijk} = p_i a_j + b_k - p_i b_k$ and that the overt response is a linear function of the subjective response, i.e., $R_{ijk} = \alpha (p_i a_j + b_k - p_i b_k) + \beta$ (where α and β are linear coefficients), then it can be shown that the marginal means of each two-factor subdesign are linearly related to the subjective stimulus values. (See Appendix A.) Furthermore, if the above propositions hold, appropriate factorial plots of two of the two-way interactions (i.e., plots of the P X A and P X B interactions) will exhibit a linear fan pattern.

For example, if the P X A operation of the model holds and the interaction is plotted such that the A_j stimuli are spaced on the abscissa according to their estimated subjective value (i.e., the A marginal means), with a separate curve for each level of the P_i stimuli, then each curve corresponding to a level of factor P should plot as a straight line function of the subjective stimulus values of A with a slope proportional to the subjective values of P. For the model to fit the data, each separate curve corresponding to the levels of factor P must

plot as straight lines. This is a stringent test, since deviant data points will cause the separate curves to be crooked. Another version of the graphical test can be obtained by plotting one row of the data matrix as a function of another row. If the data are multiplicative, each such plot should be a straight line. A similar graphical analysis can be performed for the P X B interaction.

Thus, an observed linear fan pattern for the plot of an interaction supports a multiplicative operation of a model, while also supporting the assumption that the overt responses are linear functions of the subjective responses. In general, if either assumption is incorrect (i.e., the model is incorrect or the response scale is nonlinear), then the linear fan pattern will not be obtained.

The previous graphical test should be conducted in conjunction with an analysis of variance. A significant interaction term can then be split into two components, the linear X linear (bilinear) component and the residual. If the multilinear model (Equation 3) holds, the P X A interaction should be concentrated in the bilinear component and the residual component should be nonsignificant. The same holds for the P X B interaction. The bilinear component represents the linear fan pattern, while the residual represents deviations from the linear fan (Anderson, 1970, 1974a, 1981, 1982).

It is important to note that linear fan analysis does not discriminate between a model such as $R = AP + BP$, and a more general model with additive factors: $R = A + P + B + AP + BP$. One may wonder whether it would be reasonable to hypothesize that the same stimuli could have both adding and multiplying effects. As it turns out, by changing the zero points, the original model, $R = AP + BP$, becomes $(A + a)(P + p)$

+ (B + b) (P + p) = PA + (a + b) P + pA + PB + pB + pa + pb. Thus, by allowing arbitrary zero points, the original model is linearly equivalent to the same model with additive terms (see Anderson, 1981, 1982).

Since the two models are linearly equivalent they are indistinguishable by the given test of fit, a definite limitation of the methodology. To assess the more general model requires additional information regarding stimulus zeros. Fortunately, the major substantive concern of the present study is with testing the multiplicative operations of the model and these tests do not require knowledge of stimulus zeros.

Procedure for Testing the Bilinear and Residual Components of a Two-way Interaction

In principle, the analysis parallels that of ordinary trend tests for repeated measurement designs. In ordinary trend tests, the levels of one of the stimulus factors are quantitative. In the present experiment the levels of the stimuli are manipulated by descriptive paragraphs. Thus, the factors of the design are nominally scaled (the levels are qualitative). The information integration paradigm assumes that subjects evaluate such stimulus information and place subjective numerical values (corresponding to the levels of the stimulus factors) on the information. According to functional measurement, if the relationship between two factors is multiplicative, then the marginal means of the two-way data tables from a factorial design are linearly related to the subjective stimulus values, and therefore may be used as provisional estimates of these values. Using these numerical estimates as the levels of the stimulus factors, a significant Row X Column interaction from an analysis of variance (e.g., P X A or P X B) can be broken down into its bilinear

component and a residual component. If the multiplying operation of the model holds, then the interaction should be concentrated in the bilinear component and the residual should be nonsignificant.

The majority of studies testing multiplicative operations with group data have conducted the analysis using the computer program POLYLIN (Shanteau, 1977). This program is written in FORTRAN IV and is designed to analyze the multiplicative (e.g., bilinear) trend components of interaction. The program also requires that an analysis of variance be performed.

The POLYLIN program employs a least-squares procedure which maximizes the sum of squares in the multilinear (e.g., bilinear and trilinear) component in each interaction. To accomplish this, trend coefficients are derived which maximize linearity. These coefficients are based on the marginal means from the factorial design.

If the multiplicative operation of the model is successful, then according to the logic of functional measurement (Anderson, 1974a; Anderson & Shanteau, 1970; Shanteau & Anderson, 1972), the marginal means provide the best estimates of the subjective stimulus values.

To illustrate this analysis, the bilinear and residual tests (see Anderson, 1982; Graesser & Anderson, 1974) for a multiplicative operation (i.e., a Row X Column interaction) will be outlined. The basis for the bilinear test comes from the work of Tukey (1949) and Mandel (1961).

The Bilinear Test. In order to perform the bilinear test using POLYLIN, certain contrast coefficients are required for each subject. The marginal means (i.e., the estimated subjected scale values of the stimulus factors) are used to obtain these coefficients. For each subject, let l_i and l_j be the row mean and column mean, respectively, expressed as

deviations from the grand mean. Then, using standard dot-bar notation, $l_i = (\overline{R}_{i\cdot} - \overline{R}_{\cdot\cdot})$ and $l_j = \overline{R}_{\cdot j} - \overline{R}_{\cdot\cdot})$, where $\Sigma\, l_i = \Sigma\, l_j = 0$ and $l_i l_j = (\overline{R}_{i\cdot} - \overline{R}_{\cdot\cdot})\,(\overline{R}_{\cdot j} - \overline{R}_{\cdot\cdot})$. In each cell of the design, the l_i and l_j are the linear polynomial coefficients relative to the subjective metric for the row and column factors, respectively (Anderson, 1970, 1982). In each cell, the coefficient for the bilinear component is the product of the corresponding row and column deviation scores. These products sum to zero and plot as a linear fan in the subjective stimulus metric.

The value of the bilinear component for a given subject is

$$L = \Sigma\Sigma\; l_i l_j\, \overline{X}_{ij}$$

where l_i and l_j are defined as stated above and $\overline{X}_{ij}$ is the mean of the ij^{th} cell entries (averaged over replicates and all other factors). Thus, L differs from zero to the extent that the cell means, $\overline{X}_{ij}$, correlate with the bilinear coefficients.

For a group analysis, the null hypothesis is that the mean of the L scores (over subjects) is zero. An F test is used to test the hypothesis. The sum of squares (SS) for the group bilinear test with one degree of freedom is

$$SS^*_{\text{Bilinear}} = \frac{(\Sigma\, L)^2}{N}$$

where the sum is over the N subjects (Ss) and the * denotes that individual L scores are used. The bilinear error term has the sum of squares,

$$SS^*_{\text{Ss X Bilinear}} = \Sigma\,(L)^2 - SS^*_{\text{Bilinear}}$$

with degrees of freedom (df) equal to N − 1. The ratio of the two corresponding mean squares may be treated as an F ratio on (1, N − 1) df. This test can be conducted by running an analysis of variance program

(BMD - 08V) using the individual L scores as the data to test the null hypothesis that the mean of these contrasts equals zero. The ratio of the Mean SS to the Error SS on (1, N - 1) df from this output is the correct F for the bilinear test.

The Test of the Residual. The residual test (using POLYLIN) requires the breakdown of the Row X Column interaction and its error term, the Subjects X Row X Column interaction. The sum of squares for both terms are obtained from an analysis of variance program (e.g., BMD -08V). The bilinear sum of squares are now calculated using the group data,

$$SS_{Bilinear} = \frac{(\Sigma\Sigma\ l_i l_j\ T_{ij})^2}{n\ \Sigma\Sigma\ (l_i l_j)^2}$$

where l_i and l_j are the row and column deviation scores for the group data, T_{ij} is the sum of all scores in the ijth cell of the design and n is the number of entries in a cell (averaged over subjects, replicates and other factors). A scaling factor (k) is computed to be

$$k = \frac{SS_{Bilinear}}{SS^*_{Bilinear}} .$$

According to Graesser and Anderson (1974), the scaling factor is necessary to make the sum of squares from the regular analysis of variance congruent with that of the above direct analysis using L scores (i.e., k is the value which, when multiplied by $SS^*_{Bilinear}$, yields the $SS_{Bilinear}$ from the group data).

The residual sum of squares is calculated by subtraction,

$$SS_{Residual} = SS_{Rows\ X\ Columns} - SS_{Bilinear} .$$

This sum of squares has (I - 1) (J - 1) - 1 df., where I and J refer to the number of rows and columns, respectively.

The residual error term is also calculated by subtraction,

$$SS_{\text{Residual Error}} = SS_{\text{Ss X Rows X Columns}} - (k)\ SS^*_{\text{Ss X Bilinear}} .$$

This sum of squares has (N - 1) [(I - 1) (J - 1) - 1] df. The ratio of the corresponding mean squares is treated as an F ratio with the above indicated degrees of freedom.

While the group test of the bilinear component based on the individual contrast scores provides a valid test, it has been noted (Anderson, 1982) that the group test of the residual (calculated using Shanteau's POLYLIN program) is biased due to individual differences in parameter values. The source of this bias arises because the l_i and l_j used in calculating the group SS_{Bilinear} for the residual test are over group averages. Therefore, unless the individual scale values are close to the group scale values, the test is biased.

Real individual differences tend to concentrate in the bilinear component and therefore may cause its error term $SS^*_{\text{Ss X Bilinear}}$ to be larger than the error term for the overall interaction (Anderson, 1982). The conventional test of the residual (using Shanteau's POLYLIN) mixes the use of individual and group scale values in the calculation of the residual test (but tries to correct for this inconsistency by using a scaling factor k). As a consequence, this procedure generally yields residual F's that are too small. This is a problem since the experimental hypothesis is that these interactions should be nonsignificant. The conventional way to handle this problem has been to use a more conservative (in this case higher) alpha level (e.g., α = .25). This does not provide a

satisfactory solution to the problem since it is still possible for the $SS^*_{\text{Ss X Bilinear}}$ term (multiplied by k) to be larger than the error term for the overall interaction. Therefore, residual tests using the Shanteau's POLYLIN (1977) are incorrect.

Anderson (1982) has stated that the way to get a proper test of goodness of fit is to break the Row X Column interaction into its orthogonal polynomial components (i.e., linear X linear, linear X quadratic, etc.). If the multiplying operation of the model holds, then the bilinear component should be significant, while all other polynomial components should be nonsignificant. These calculations may be performed by employing the Weiss-Shanteau (1982) Group-Individual POLYLIN program. The program is written in BASIC-PLUS for an interactive system and programmed for a PDP-11/70.

To illustrate the procedure, the group tests for two components (i.e., the linear X linear and linear X quadratic) will be outlined. Using the notation presented in Anderson (1982), the algebraic value of the bilinear component for a given subject (divided by the normalizing factor that puts it on the same scale as the overall interaction) is

$$LL = \Sigma\Sigma\ l_i l_j\ T_{ij}\ /\ [n\ \Sigma\Sigma\ (l_i l_j)^2]^{1/2}$$

where $l_i = \overline{R}_{i.} - \overline{R}_{..}$ and $l_j = \overline{R}_{.j} - \overline{R}_{..}$, T_{ij} is the total of the n scores for the ij^{th} cell and the summation is over all cells of the design.

For a group analysis, the value of the bilinear component is computed separately for each subject using the above formula. The null hypothesis, that the true mean LL score is zero, is tested by an F test. The sum of squares for the bilinear component on 1 df is

$$SS_{L\ X\ L} = (\ \Sigma\ LL)^2\ /\ N$$

where the summation is over N subjects. The error term for the bilinear component on N - 1 df is

$$SS_{L \times L \times \text{Subjects}} = \Sigma\ (LL)^2 - SS_{L \times L} .$$

An F test is performed using the ratio of the corresponding mean squares on (1, N - 1) df.

The linear X quadratic (LQ) component is tested similarly. An LQ score is calculated for each subject

$$LQ = \Sigma\Sigma\ l_i q_j\ T_{ij}\ /\ [n\ \Sigma\Sigma\ (l_i q_j)^2]^{1/2}$$

where $l_i = \overline{R_i}. - \overline{R}..$ and the q_j are quadratic coefficients computed to be orthogonal to the linear l_j (Keppel, 1973; Weiss, 1980).

The sum of squares for the LQ component on 1 df is

$$SS_{L \times Q} = (\ \Sigma\ LQ)^2\ /\ N$$

where the summation is over all N subjects. The L X Q error term on (N - 1) df is calculated to be

$$SS_{L \times Q \times \text{Subjects}} = \Sigma\ (LQ)^2 - SS_{L \times Q} .$$

The null hypothesis is that the true mean LQ score is zero. It is tested by an F test on (1, N - 1) df. The other polynomial components (e.g., QL, QQ) are tested similarly. If the model holds then the LL component should be significant, but all other polynomial components should be nonsignificant. Since the LQ (QL, etc.) score is orthogonal to the LL score, it provides a valid test of the residual. (See Anderson, 1982.)

As previously mentioned, the Weiss-Shanteau Group-Individual POLYLIN (1982) is written in BASIC-PLUS. Unfortunately, this version of BASIC was unavailable to the researcher. Therefore, the earlier version of POLYLIN (Shanteau, 1977) was used to conduct the bilinear test. The test of the

bilinear component using this program is valid; however, the test of the residual for a group analysis is incorrect. Since the functional measurement framework requires both the bilinear and the residual test to establish a multiplicative operation, both tests were performed. However, the residual tests were interpreted with extreme caution and graphical tests were also used.

Most studies of models with multiplicative operations (using group data) have relied on the graphical test or the biased test previously outlined. Anderson (1982) has stated that the bias can be serious; but nearly all the experiments in question have been reanalyzed using the unbiased method and only a few minor changes in the conclusions have resulted.

Parallelism Analysis

As previously stated, parallelism analysis applies to the factors in the multilinear model which are separated by a plus sign. Consider a multilinear model where two factors are assumed to be additive. If the adding operation of the multilinear model holds and the overt response is a linear function of the subjective response, then the factorial plot of the data (e.g., the plot of the A X B interaction for the present experiment) should display a pattern of parallelism. Furthermore, the row and column marginal means of the A X B data table should constitute linear scales of the subjective values of the stimulus factors (Anderson, 1970, 1974a, 1981, 1982). (The latter point is shown for a multiplying model in Appendix B.) Observed parallelism provides support for the above assumptions. In general, if either assumption is incorrect (i.e., the adding model does not hold or the overt response is not a linear function

of the subjective response), parallelism will not be obtained. There is the logical possibility that the nonlinearity in the response scale could balance nonlinearity in the integration rule to yield parallelism, but this seems unlikely.

The parallelism analysis generalizes to the A X B subdesign of the present experiment. If the A X B interaction is nonsignificant, the marginal means of the A X B data tables can still provide linear scales of the subjective stimulus values, even though the marginal means are averages over factors in the multilinear model (Anderson, 1982). To illustrate this point, consider the model, $R = PA + B - PB$, where the effect of P on the response is not independent of A and B. Anderson (1982) has pointed out that for each level of P, the P effect can be represented as a linear transformation on the basic A X B parallelism pattern. The marginal means of the A X B table are, therefore, linearly equivalent across the levels of P. Thus, the marginal means of the A X B tables for each level of P can provide linear scales and so can their averages.

Graphical Predictions

If the mean ratings of the overall value of claiming the image are plotted as a function of the subjective value of successfully claiming the image (A), with a separate curve for the levels of the perceived probability of successfully claiming the image (P), then an interaction is predicted by the multiplicative relation between A and P. If the abscissa values are spaced according to the marginal means, then the curves should be linear. Moving across the levels of A, the change in response should be proportional to P.

Similarly, when mean ratings are plotted as a function of the value of unsuccessfully claiming the image (B), with a separate curve for the levels of P, and the values on the abscissa are spaced according to the marginal means, then the linear fan pattern should again be obtained. Furthermore, if subjects infer the probability of an unsuccessful claim from the probability given for a successful claim (i.e., $P' = 1 - P$), then it is predicted that the ordering of the magnitude of the slopes for the P X B graph should be opposite that of the P X A graph.

The model predicts that all other effects are additive. Therefore, when the mean ratings are plotted as a function of A, with a separate curve for the levels of B (averaging over the levels of P), the curves should display parallelism. When the marginal means are used for the values on the abscissa, the curves should be linear.

Statistical Predictions

The model predicts that the P X A and P X B interactions of an analysis of variance should be statistically significant. These interactions should be concentrated in the single degree of freedom associated with the linear X linear (bilinear) component of the interaction. Furthermore, no higher order interactions are predicted to be significant.

Design

The present research used the information integration paradigm and functional measurement methodology to algebraically model judgments of the overall desirability of claiming a specific image. To test the model, a split-plot experiment was used. Participants were asked to imagine

themselves in a job interview situation. Based on information contained in descriptive scenarios, all subjects were asked to make ratings of (a) how likely it would be for him/her to actually claim the specific image favored by the interviewer, (b) how much he/she would want to claim the specific image, and (c) how good he/she would feel about claiming the image.

The type of employee the interviewer favored for promotion (i.e., a person who gets along well with others and supports superiors versus one who is confident and thinks independently) was varied between subjects. This factor (I) was included to test the generality of the model. If the integration process follows the hypothesized model and the values of the A, P and B components remain the same, no significant differences between groups should be obtained.

The A, P and B components of the model were manipulated by describing (a) the value of successfully emphasizing the qualities the interviewer favored (factor A), (b) the probability that the interviewer would believe such a claim (factor P), and (c) the value of unsuccessfully emphasizing the qualities the interviewer favored (factor B). The study included two replications (R) of the within subject factorial design (for each subject). For the overall group analysis, replications were treated as nested within subjects, while subjects were nested within the between subjects factor, I. The within subjects factors (i.e., the repeated measures) were A, P and B.

CHAPTER II
METHOD

Subjects

Subjects were 60 students (30 males and 30 females) enrolled in introductory psychology courses, participating in partial fulfillment of a course requirement. Subjects were run in small groups of two to five, in each of two one-hour sessions. Each person completed one replicate (all 27 scenarios) at both sessions. The second replicate was collected in a session later in the same week.

Materials

Participants were asked to respond to variations of a job interview scenario. The scenarios asked subjects to imagine themselves as employees (of a large business firm) who are being considered for a job promotion, but must first interview for the new job. Subjects were randomly assigned to receive instructions stating either the interviewer has favored people who get along well with others and support superiors' opinions and policies without question (Form I-1), or the interviewer has favored people who express their own ideas and are confident of their skills at handling the job (Form I-2). (See Appendices C and D for oral and written instructions.)

The subject's task was to consider how he/she would characterize him or herself at the job interview, based on the information presented in each scenario. Subjects were told that if they emphasized the

qualities the interviewer was looking for and the interviewer believed them, they would have a good chance to get the job promotion.

The value of successfully claiming the image (A) was manipulated by describing the expected outcomes of emphasizing the qualities the interviewer favored and having the interviewer believe the claim. The outcomes were varied over three levels. In one condition the description indicated that the outcomes of successfully presenting themselves as possessing the qualities the interviewer favored (and thus getting the job promotion) would not be very positive. In another condition the description indicated that getting the job promotion would be moderately positive, while in the third condition the promotion was described as very positive.

The probability of a successful image claim (P) was also varied over three levels, i.e., only a slim chance, a 50/50 chance or an excellent chance that the interviewer would believe the claim.

Finally, the value of the image if it was unsuccessfully claimed (B) also had three levels. In one condition the outcomes of presenting oneself as possessing the qualities the interviewer favored, but not being believed by the interviewer, were described as very negative. In the other two conditions the outcomes were described as either moderately negative or not really negative. Following each scenario subjects answered questions about their behavior/feelings in that situation.

In all, 27 scenarios were presented to a subject at each session, reflecting all possible combinations of the value of successfully claiming the image (A), the probability of successfully claiming the image (P) and the value of an unsuccessful image claim (B).

An example of one of the 27 scenarios is presented for clarity. (See Appendix E for a description of all scenarios.) For subjects assigned to receive the instructions stating that the interviewer has favored people who get along well with others and support superiors' opinions and policies without question (Form I-1), the booklet cover-page stated

> You are to imagine that you are an employee in a large business firm. You are being considered for a job promotion and you must interview for the new job. You know that in the past the interviewer, the person making the promotional decision, has favored people who get along well with others and support superiors' opinions and policies as opposed to people who express their own ideas and are exceptionally confident of their skills at handling the job. Furthermore, at the interview you will be asked to describe personal characteristics that make you right for the job. You decide to emphasize strategically certain self-relevant facts you want the interviewer to know.
>
> You are considering how to characterize yourself at the job interview. You've considered what you know about the interviewer, your qualities and what he knows about you. You believe that if you emphasize the qualities the interviewer is looking for (e.g., that you get along well with others and are willing to support superiors' opinions and policies) and he believes you, then you have a good chance to get the job.

Subjects then turned the page and began the scenarios. A separate scenario was presented on each page. The following scenario represents a design cell where the value of a successful image claim (A) is very positive, the probability of a successful image claim (P) is slim, and the value of an unsuccessful image claim (B) is very negative.

> The job means a large increase in salary, status and power. Although the job requires working extra hours and greater responsibility, you're looking forward to the challenge. You will also be given a private office, secretarial staff and unlimited use of a company car. You believe that with this promotion you will finally advance to the job you really want. Considering everything you know, you believe that getting this job promotion is extremely desirable.
>
> You realize that emphasizing the qualities the interviewer is looking for does not mean that he'll believe you. Based on the situation, the interviewer's reputation for believing versus disbelieving what people say about themselves and what the

> interviewer knows about you (e.g., your reputation, job record), you think that if you do emphasize these qualities, there is only a slim chance he'll believe you.
>
> Furthermore, if he does not believe what you say about yourself, there is a good chance that the consequences would be very negative. Given what you know about him, he would probably view you as being very dishonest and have a very low opinion of you. His position in the company would allow him to influence future salary increases, give unpleasant job assignments and work hours and in general make your life miserable. He could even fire you.

Dependent Measures. Following each scenario subjects were asked to respond to three questions by choosing a number, from zero to 100, that best represented their response. For subjects instructed that the interviewer has favored people who get along well with others and support superiors' opinions and policies, the major dependent measures were presented as follows:

1. How likely would it be for you to emphasize your ability to get along well with others and your support for superiors' opinions and policies?

   ______________ (0 = not at all likely & 100 = completely likely)

2. How much would you want to emphasize your ability to get along well with others and your support for superiors' opinions and policies?

   ______________ (0 = not at all & 100 = very much)

3. How good would you feel about emphasizing your ability to get along well with others and your support for superiors' opinions and policies?

   ______________ (0 = extremely bad & 100 = extremely good)

Subjects who were instructed that the interviewer has favored people who express their own ideas and are confident of their skills at handling the job were asked essentially the same questions, except the characteristics were changed to correspond to their instructions.

At the end of the study (following the second replicate only), subjects were asked to rate their own behavior in a work related situation

in terms of (a) the extent to which they get along well with others and support superiors' opinions and policies and (b) the extent to which they express their own opinions and feel confident of their skills in handling the job. They were also asked to evaluate a person who possessed the above (a) and (b) characteristics. Again, subjects were to choose a number from zero to 100 to represent their response. (See Appendix F.)

Procedure

After filling out consent forms, subjects received instructions for completing the scenarios. These were given orally by the experimenter and in written form (Appendices C and D). The instructions emphasized that subjects were to assume that the information given in the scenarios was all that they knew and that the description represented their real beliefs about the situation. Furthermore, they were to consider each scenario as independent and think about only one scenario at a time.

After receiving instructions, subjects were asked to complete three practice scenarios to gain familiarity with the task and to achieve stability in the use of the response scale. The practice scenarios were chosen to represent the more extreme (positive and negative) outcomes that could occur. All subjects completed the same practice scenarios, but in random order.

Each scenario booklet contained the same 27 scenarios in a different random order. Furthermore, each replication was randomized separately. Subjects received the same instructions (indicating the characteristics favored by the interviewer) for both replications.

At the end of the study, subjects were told the purpose of the experiment. They were also given the opportunity to comment and to ask questions.

CHAPTER III
RESULTS

This experiment tested whether decisions regarding self-presentations follow the relative weight averaging model of Equation 1. The model implies that the expected value of a successful claim (A) and the expected value of an unsuccessful claim (B) are weighted by the perceived probability of a successful claim (P) and the perceived probability of an unsuccessful claim ($P' = 1 - P$), respectively, and averaged to determine the overall expected value of claiming an image. According to the present perspective, people claim those images with the highest overall expected values. Therefore, it was assumed that the higher the overall expected value for a claim, the higher subjects' ratings would be of their likelihood of claiming the image. Thus, the major dependent variable asked subjects to rate how likely they would be to emphasize the characteristics favored by the interviewer. (This dependent measure will be subsequently referred to as the likelihood measure.) Since subjects' intentions to claim certain images could vary from their feelings about making such claims, two additional dependent variables were included. Subjects were asked to rate how much they would want to emphasize the characteristics the interviewer favored and how good they would feel about doing it (the desire and feeling measures, respectively).

Group Analysis of the Likelihood Measure

Table 1 presents the overall analysis of variance (ANOVA) summary table for the likelihood measure. The group analysis is based on 60 subjects (S), with two replications (R) per subject. The factor I (the characteristics favored by the interviewer) represents a between subjects factor. The A, P and B factors refer to the components of the model. Given the power of the overall statistical tests, an alpha level of .01 was set as the criterion of statistical significance.

As indicated in Table 1, the A, P and B main effects were significant. In terms of the model analysis they are of minor interest, since the interaction tests provide the way to diagnose the fit of the model.

As was expected, no significant effect of I (the characteristics favored by the interviewer) was obtained (except in an uninterpretable four-way interaction). Thus, when the values of the P, A and B components were held constant, no significant differences were found between the groups of subjects instructed that either (a) the interviewer favors people who get along well with others and support superiors or (b) the interviewer favors those who express their own ideas and are confident of their skills.

Of primary importance to the model analysis were the tests of interaction. The integration model of Equation 1 implies that the P X A and P X B interactions should be significant. If the multiplicative operations of the multilinear model hold, then the corresponding breakdown of each interaction term should reveal a significant bilinear component and a nonsignificant residual.

Table 1

Overall Analysis of Variance Summary Table
for the Likelihood Measure

SOURCE	DF	SS	F	PR > F
I	1	189.71	0.02	0.8871
S(I)	58	540833.89	17.44	0.0001
R(S I)	60	32072.59	Error	
A	2	1113731.27	405.85	0.0001
A X I	2	4947.63	1.80	0.1671
A X R(S I)	236	323814.95	Error	
B	2	73002.42	72.93	0.0001
B X I	2	1311.59	1.31	0.2717
B X R(S I)	236	118110.72	Error	
P	2	43243.50	73.19	0.0001
P X I	2	1176.21	1.99	0.1389
P X R(S I)	236	69719.03	Error	
A X P	4	6575.06	8.46	0.0001
A X P X I	4	2005.87	2.58	0.0366
A X P X R(S I)	472	91675.88	Error	
A X B	4	6400.55	9.09	0.0001
A X B X I	4	534.83	0.76	0.5518
A X B X R(S I)	472	83051.43	Error	
B X P	4	2078.46	4.80	0.0008
B X P X I	4	329.16	0.76	0.5514
B X P X R(S I)	472	51073.63	Error	
A X B X P	8	693.23	0.85	0.5571
A X B X P X I	8	2152.51	2.64	0.0072
A X B X P X R(S I)	944	96035.44	Error	

Note. An ANOVA was also conducted adding sex of subject as another between subjects factor. No effect of sex was found on any of the dependent measures.

As indicated in Table 1, the P X A and P X B interactions were significant, $\underline{F}(4, 472) = 8.46$, $p < .0001$ and $\underline{F}(4, 472) = 4.80$, $p < .0008$, respectively. Mean ratings on the likelihood measure for the P X A and P X B interactions (along with results of follow-up tests) are presented in Tables 2 and 3, respectively.

Results of the bilinear test for the P X A interaction revealed that it was only significant if alpha was set at .05, $\underline{F}(1, 59) = 5.11$. The incorrect residual test for group data (performed by Shanteau's POLYLIN program) suggested that the residual interaction was also significant, $\underline{F}(3, 177) = 16.29$. (Recall that this $\underline{F}$ value is probably smaller than it should be.) These results suggest that the P X A interaction is concentrated in more than the one degree of freedom for the bilinear component. If the Weiss-Shanteau (1982) Group-Individual POLYLIN program were available, the interaction could be further broken down into its orthogonal polynomial components and a valid test of the residual would be possible. Even though there are problems with the group test of the residual (as conducted), the results of the valid bilinear test in conjunction with a graphical analysis should be sufficient to test the general fit of the model.

Figure 2 shows the mean judged likelihood of claiming the image as a function of A (the expected value of a successful claim), with a separate curve for each level of P (the probability of a successful claim). The abscissa values have been spaced according to the marginal means. This is the set of stimulus values that best fits the multiplying model to the data. Therefore, if the model fails, it cannot be attributed to shortcomings in the stimulus values.

Table 2

Mean ratings of how likely it would be for subjects to emphasize the characteristics favored by the interviewer, for the P X A interaction

Probability of a Successful Claim (P)		Expected Value of a Successful Claim (A): Not Positive a_1	Moderately Positive a_2	Very Positive a_3	Marginal Means
Slim	p_1	33.72	52.89	76.41	54.34
50/50	p_2	37.41	58.24	81.06	58.90
Excellent	p_3	38.07	63.84	87.95	63.29
Marginal Means		36.40	58.33	81.80	

Note. Each cell contains 360 responses. Tests of simple main effects (with $df = 2, 708$) significant at the .001 level or less revealed simple main effects of

1. A at p_1: $F = 280.47$,
2. A at p_2: $F = 292.40$,
3. A at p_3: $F = 381.63$,
4. P at a_1: $F = 8.70$,
5. P at a_2: $F = 47.35$,
6. P at a_3: $F = 53.22$.

Tukey's Honest Significant Difference (HSD) test (which sets the experimentwise error rate at alpha) was used to conduct all pairwise comparisons among the means. The results (for $\alpha = .01$) indicated that

1. the mean for a_1p_1 did not differ significantly from that of a_1p_2,
2. the mean for a_1p_2 did not differ significantly from that of a_1p_3,
3. all other means differed significantly from each other.

Table 3

Mean ratings of how likely it would be for subjects to emphasize the characteristics favored by the interviewer, for the P X B interaction

		Expected Value of an Unsuccessful Claim (B)			
Probability of a Successful Claim (P)		Very Negative b_1	Moderately Negative b_2	Not Negative b_3	Marginal Means
Slim	p_1	46.90	56.06	60.05	54.25
50/50	p_2	52.11	60.98	63.62	58.90
Excellent	p_3	58.36	63.68	67.82	63.29
Marginal Means		52.46	60.24	63.83	

Note. Each cell contains 360 responses. Tests of simple main effects (with $df = 2, 708$) significant at the .001 level or less revealed simple main effects of

1. B at p_1: $F = 68.46$,
2. B at p_2: $F = 54.75$,
3. B at p_3: $F = 33.89$,
4. P at b_1: $F = 69.41$,
5. P at b_2: $F = 31.52$,
6. P at b_3: $F = 31.89$.

Tukey's HSD test was used to conduct all pairwise comparisons among the means. The results are summarized below. The means that are underlined do not differ significantly ($\alpha = .01$).

p_1b_1 p_2b_1 p_1b_2 p_3b_1 p_1b_3 p_2b_2 p_2b_3 p_3b_2 p_3b_3

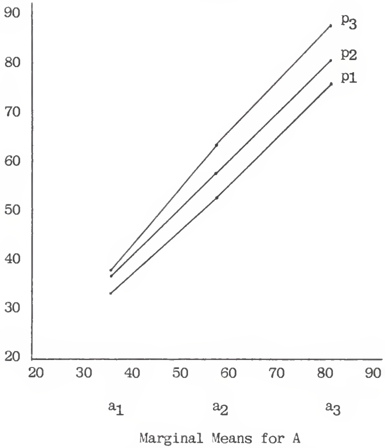

Figure 2. P X A interaction. The mean judgments on the likelihood measure are plotted as a function of the A marginal means. The ratings are based upon (A) the expected value of a successful claim (a_1 = not positive, a_2 = moderately positive, and a_3 = very positive) and (P) the probability of a successful claim (p_1 = slim chance, p_2 = 50/50 chance and p_3 = excellent chance).

According to the quantitative predictions of the model, multiplication of P X A implies that each level of P should form a straight line function of A. Furthermore, the curves should form a diverging linear fan pattern with the slopes of the curves proportional to P. Examination of the graph in Figure 2 does suggest a weak diverging trend. The effect of P is negligible when the expected value of a successful claim (A) is at its low level (not positive). This effect is predicted by a multiplicative operation. However, the pattern does not fan as much as a true bilinear (multiplicative) data pattern predicts. When the expected value of a successful claim is very positive (a_3), the mean for a high probability of success (p_3) is less than a true multiplicative operation would suggest, while the mean for a low probability of success (p_1) is greater than expected.

The qualitative findings concerning the ordering of the P X A interaction means are consistent with those predicted by the model. However, a stringent quantitative analysis only suggests a weak multiplicative data pattern.

The bilinear test for the P X B interaction did not reach significance, $F(1, 59) = 2.73$. Although the overall P X B interaction was significant, the interaction was not located in the bilinear component.

Figure 3 shows the mean judged likelihood of claiming the image as a function of B (the expected value of an unsuccessful claim), with a separate curve for each level of P (the probability of a successful claim). The values along the abscissa are spaced according to the B marginal means. Examination of the graph indicates that the qualitative findings are consistent with the model. The effects of P appear to be least when the value of B is not really negative (b_3) and greatest when

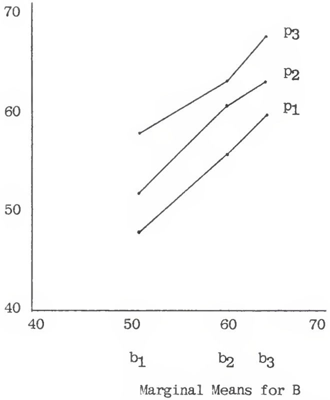

Figure 3. P X B interaction. The mean judgments on the likelihood measure are plotted as a function of the B marginal means. The ratings are based upon (B) the expected value of an unsuccessful claim (b_1 = very negative, b_2 = moderately negative, and b_3 = not negative) and (P) the probability of an unsuccessful claim (p_1 = slim chance, p_2 = 50/50 chance and p_3 = excellent chance).

the value of B is very negative (b_1). These effects produce the slight converging trend. Although there is some fanning, the graph of the P X B interaction does not display a true bilinear data pattern; the curves are not straight line functions of B with a common origin. Examination of the cell means that appear to be most discrepant from the predictions of the model suggests that the mean for cell p_3b_3 (the probability of success is high and the expected value of an unsuccessful claim is not negative)is greater than the model predicts. Furthermore, the p_2b_2 cell mean (the probability of success is 50-50 and the expected value of an unsuccessful claim is moderately negative) appears to be too high.

Follow-up tests (see Note, Table 3) were conducted to help interpret the interaction. As one might expect, subjects appeared less likely to claim the image when the expected value of an unsuccessful claim was very negative and there was a moderate to good chance that the claim would be unsuccessful. The lowest P X B mean was produced by the stimulus combination p_1b_1, which was significantly lower than any other treatment combination. The next lowest P X B mean was produced by condition p_2b_1, which was significantly higher than the p_1b_1 mean, but significantly lower than the means for all other stimulus combinations.

Subjects appeared most likely to claim the image when nothing really bad would happen by claiming it. Thus, the mean rating for condition p_3b_3 (the probability of success is high and the expected value for an unsuccessful claim is not negative) was significantly higher than any of the other P X B means.

The results further indicated that the mean rating for the condition p_3b_3 (the probability of success is high and the expected value of an unsuccessful claim is moderately negative), did not differ significantly

from the conditions p_2b_2 or p_2b_3 (the probability of success is 50-50, and the expected value of an unsuccessful claim is either moderately negative or not negative), respectively. Also, the latter two conditions did not differ significantly.

Finally, the mean rating for condition p_3b_1 (the probability of a successful claim is high and the expected value of an unsuccessful claim is very negative) did not differ significantly from the conditions p_1b_2 or p_1b_3 (the probability of a successful claim is slim and the expected value of an unsuccessful claim is either moderately negative or not negative, respectively).

Thus, under some conditions it appears that positive and negative information on the different dimensions (P and B) could balance one another. For example, the mean rating, under the condition where there was a high probability of success and a moderately negative value for an unsuccessful claim, did not differ from the mean rating in the condition where the probability of success was 50-50 and the value for an unsuccessful claim was not really negative.

It is interesting that the ordering of the magnitude of the slopes for the graphs of the P X B and P X A interactions is fairly consistent with the relative weighting scheme proposed by the model. Comparison of the graphs in Figures 2 and 3 suggests that A has the greatest effect when the probability of a successful claim is high, while B has the least effect when the probability of a successful claim is high (or the probability of an unsuccessful claim is low). This finding is consistent with the notion that P and 1 - P serve as relative weights for the A and B components, respectively. The ordering of the magnitude of the slopes is less clear for the lower levels of P.

Contrary to predictions, the overall ANOVA (Table 1) revealed a significant A X B interaction, $\underline{F}(4, 236) = 4.69$, $p < .0001$. (See Table 4 for the A X B interaction means.) The test of the bilinear component was also conducted for the A X B interaction. The bilinear component was significant if alpha was set at .05, $\underline{F}(1, 59) = 4.67$. The test of the residual produced a negative sum of squares, demonstrating the problem with the group residual test (i.e., the $SS^*_{\text{Ss X Bilinear}}$ based on the individual parameter estimates can be larger than the error term for the overall interaction).

Figure 4 plots the A X B interaction as a function of the A marginal means with a separate curve for each level of B. The model predicted that the effects of A and B would be additive (i.e., the effect of one factor should not depend on the level of the other factor). This implies that the curves should be parallel. Although the top two curves appear parallel, the curve for a very negative expected value for an unsuccessful claim (b_1) shows a clear discrepancy. When the value of an unsuccessful claim is very negative, the judged likelihood of claiming the image is lower than additivity would predict, producing a diverging data pattern.

It was previously suggested that the scale values for the A and B components could have separate absolute weights (beyond that implied by the probabilities). If (as other research has suggested) negative and/or extreme outcomes receive higher weights, then the pattern of the A X B interaction could imply differential-weight averaging.

An unpredicted A X P X B X I interaction was obtained, $\underline{F}(8, 944) = 2.64$. (See Table 1.) This interaction did not reach significance (even at $\alpha = .05$) when the data were reanalyzed using the

Table 4

Mean ratings of how likely it would be for subjects to emphasize the characteristics favored by the interviewer, for the A X B interaction

		Expected Value of a Successful Claim (A)		
Expected Value of an Unsuccessful Claim (B)	Not Positive a_1	Moderately Positive a_2	Very Positive a_3	Marginal Means
Very Negative b_1	32.32	51.97	73.10	52.46
Moderately Negative b_2	37.40	59.28	84.04	60.24
Not Negative b_3	39.48	63.74	88.28	63.83
Marginal Means	36.40	58.33	81.80	

Note. Each cell contains 360 responses. Tests of simple main effects (with $df = 2, 708$) significant at the .001 level or less revealed simple main effects of

1. A at b_1: $F = 260.57$,
2. A at b_2: $F = 341.05$,
3 A at b_3: $F = 372.96$,
4. B at a_1: $F = 17.21$,
5. B at a_2: $F = 44.81$,
6. B at a_3: $F = 77.76$.

Using Tukey's HSD test, the only means that were not significantly different from each other were a_1b_2 and a_1b_3.

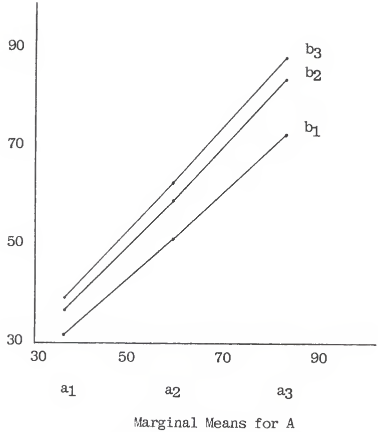

Figure 4. A X B interaction. The mean ratings on the likelihood measure are plotted as a function of the A marginal means. The ratings are based upon (A) the expected value of a successful claim (a_1 = not positive, a_2 = moderately positive, and a_3 = very positive) and (B) the expected value of an unsuccessful claim (b_1 = very negative, b_2 = moderately negative and b_3 = not negative).

Geisser-Greenhouse (1958) correction (assuming maximal heterogeneity of the variance-covariance matrix). (See Appendix G.) Further examination of the interaction suggested that it was not of a systematic nature. Therefore, there is some doubt of its true significance.

These results demonstrated that the factors of the model did influence subjects' decisions about their self-presentations. While the proposed model did not pass the stringent quantitative test of fit, it should be noted that the ordering of the means for the various interactions is not inconsistent with that proposed by the present perspective. The general effects that were anticipated were obtained.

Group Analysis of the Desire and Feeling Measures

Separate ANOVAs were performed on the dependent measures asking subjects how much they would want to claim the image the interviewer favored (the desired measure) and how good they would feel about doing it (the feeling measure). The results indicated that the P X A interaction was significant for both, $\underline{F}(4, 472) = 8.81$, $p < .0001$ and $\underline{F}(4, 472) = 7.04$, $p < .0001$, respectively. The graphs of the P X A interactions for both these dependent measures displayed a pattern similar to that found for the likelihood measure. Therefore, they will not be presented. The P X A interaction means are presented for the desire and feeling measures in Tables 5 and 6, respectively.

Separate bilinear tests of the P X A interaction were conducted on the two measures. The results indicated that the bilinear component was not significant for either dependent measure.

The graphs of the P X B interactions for each of these dependent measures appeared more additive than that of the likelihood measure. The

Table 5

Mean ratings of how much subjects would want to emphasize the characteristics favored by the interviewer, for the P X A interaction

Expected Value of a Successful Claim (A)					
Probability of a Successful Claim (P)		Not Positive a_1	Moderately Positive a_2	Very Positive a_3	Marginal Means
Slim	p_1	33.18	52.40	77.16	54.25
50/50	p_2	37.09	57.17	80.85	58.37
Excellent	p_3	37.56	63.33	86.90	62.60
Marginal Means		35.94	57.63	81.64	

Note. Each cell contains 360 responses. Tests of simple main effects (with df = 2, 708) significant at the .001 level or less revealed simple main effects of

1. A at p_1: F = 250.11,
2. A at p_2: F = 246.91,
3. A at p_3: F = 313.31,
4. P at a_1: F = 10.05,
5. P at a_2: F = 52.16,
6. P at a_3: F = 42.01.

Table 6

Mean ratings of how good subjects would feel about emphasizing the characteristics favored by the interviewer, for the P X A interaction

		Expected Value of a Successful Claim (A)			
Probability of a Successful Claim (P)		Not Positive a_1	Moderately Positive a_2	Very Positive a_3	Marginal Means
Slim	p_1	36.07	50.82	68.69	51.83
50/50	p_2	39.70	54.45	72.54	55.56
Excellent	p_3	40.57	61.19	77.82	59.86
Marginal Means		38.78	55.49	72.98	

Note. Each cell contains 360 responses. Tests of simple main effects (with $df = 2, 708$) significant at the .001 level or less revealed simple main effects of

1. A at p_1: $F = 148.44$,
2. A at p_2: $F = 151.40$,
3. A at p_3: $F = 194.89$,
4. P at a_1: $F = 10.10$,
5. P at a_2: $F = 48.97$,
6. P at a_3: $F = 38.00$.

overall P X B interactions did not reach statistical significance for either measure. (See Tables 7 and 8 for the P X B interaction means on the desire and feeling measures, respectively.)

The A X B interaction was significant for both the desire and feeling measures, $\underline{F}(4, 472) = 4.69$, $p < .001$ and $\underline{F}(4, 472) = 4.98$, $p < .0006$, respectively. The A X B interaction means for these measures are presented in Tables 9 and 10. With the criterion of significance set at alpha equal .01, no higher order interactions were significant.

Overall, the results on the desire and feeling measures appear to be similar to those for the likelihood measure. However, one difference was that the overall P X B interaction did not reach significance. The pattern of the P X B means (for the desire and feeling measures) appeared to be more additive. The patterns for these dependent measures on the P X A and the A X B interactions were similar to those found for the likelihood measure.

Individual Subject Analysis

According to the present framework, subjects were expected to obey the same integration rule. Therefore, the major analyses were conducted on the group data. However, some researchers have argued that analysis at the individual level is most meaningful because ideally the basic unit of psychological analysis is the individual. Since each subject received the complete factorial experiment twice, analysis at the individual level was possible.

Two methods for the analysis of individual subject data have been proposed (see Anderson, 1982). The first method uses the pooled

Table 7

Mean ratings of how much subjects would want to emphasize the characteristics favored by the interviewer, for the P X B interaction

		Expected Value of an Unsuccessful Claim (B)			
Probability of a Successful Claim (P)		Very Negative b_1	Moderately Negative b_2	Not Negative b_3	Marginal Means
Slim	p_1	48.72	55.37	58.66	54.25
50/50	p_2	52.49	59.55	63.07	58.37
Excellent	p_3	57.71	63.62	66.47	62.60
Marginal Means		52.97	59.51	62.74	

Note. Each cell contains 360 responses. Tests of simple main effects (with df = 2, 708) significant at the .001 level or less revealed simple main effects of

1. B at p_1: F = 43.91,
2. B at p_2: F = 49.72,
3. B at p_3: F = 34.20,
4. P at b_1: F = 39.46,
5. P at b_2: F = 32.93,
6. P at b_3: F = 29.71.

Table 8

Mean ratings of how good subjects would feel about emphasizing the characteristics favored by the interviewer, for the P X B interaction

		Expected Value of an Unsuccessful Claim (B)			
Probability of a Successful Claim (P)		Very Negative b_1	Moderately Negative b_2	Not Negative b_3	Marginal Means
Slim	p_1	42.86	53.55	59.07	51.83
50/50	p_2	45.67	57.98	63.03	55.56
Excellent	p_3	51.70	62.05	65.84	59.86
Marginal Means		46.74	57.86	62.64	

Note. Each cell contains 360 responses.

Table 9

Mean ratings of how much subjects would want to emphasize the characteristics favored by the interviewer, for the A X B interaction

	Expected Value of a Successful Claim (A)			
Expected Value of an Unsuccessful Claim (B)	Not Positive a_1	Moderately Positive a_2	Very Positive a_3	Marginal Means
Very Negative b_1	32.39	51.10	75.42	52.97
Moderately Negative b_2	36.81	59.18	82.54	59.51
Not Negative b_3	38.62	62.62	86.97	62.74
Marginal Means	35.40	57.63	81.64	

Note. Each cell contains 360 responses. Tests of simple main effects (with *df* = 2, 708) significant at the .001 level or less revealed simple main effects of

1. A at b_1: F = 232.30,
2. A at b_2: F = 260.97,
3 A at b_3: F = 291.68,
4. B at a_1: F = 14.59,
5. B at a_2: F = 49.80,
6. B at a_3: F = 48.29.

Table 10

Mean ratings of how good subjects would feel about emphasizing the characteristics favored by the interviewer, for the A X B interaction

	Expected Value of a Successful Claim (A)			
Expected value of an Unsuccessful Claim (B)	Not Positive a_1	Moderately Positive a_2	Very Positive a_3	Marginal Means
Very Negative b_1	31.47	46.28	62.48	46.74
Moderately Negative b_2	40.77	57.76	75.05	57.86
Not Negative b_3	44.10	62.42	81.41	62.64
Marginal Means	38.78	55.49	72.98	

Note. Each cell contains 360 responses. Tests of simple main effects (with $df = 2, 708$) significant at the .001 level or less revealed simple main effects of

1. A at p_1: $F = 29.40$,
2. A at p_2: $F = 161.26$,
3. A at p_3: $F = 191.07$,
4. B at a_1: $F = 42.69$,
5. B at a_2: $F = 68.78$,
6. B at a_3: $F = 92.49$.

within-cell variability for the error term. Analysis by this method assumes that the responses are independent (as in a completely randomized design). This method has probably been used most frequently. The second method treats replications as if they were subjects and a repeated measures analysis is performed. As in the first method, the second method assumes that a subject's responses from one replication (session) to another are independent. A repeated measures analysis usually increases the power of the statistical tests. However, there may be little advantage if only a small number of replications have been obtained, since the degrees of freedom for the error terms may be substantially reduced.

It is doubtful whether the assumptions underlying either of the two proposed methods actually hold. Nevertheless, some researchers advocate individual subject analysis as the only method of analysis; others advocate using it in conjunction with a group analysis (to examine whether the group data appear to reflect individual processing).

While individual subject analyses are not the focus of the present study, they were conducted (using the first method) in order to conform to convention. Since it is doubtful whether the assumptions underlying the individual subject analyses have been met, and since each subject completed only two replications of the experiment, the results were not used in the overall interpretation of the study. (Researchers who are willing to relax the assumptions and focus on individual subject analyses should have subjects complete several replications of the experiment in order to have adequate power to reject an inappropriate model.)

According to present framework, if the model of Equation 1 holds, then for each subject the P X A and P X B interactions from the individual ANOVA should be significant. Furthermore, these interactions should each

be concentrated in one df for the bilinear component and have a nonsignificant residual. No other interactions should be significant.

Shanteau's (1977) POLYLIN program, in conjunction with an ordinary ANOVA for each subject's data, can be used to analyze the data. At the individual subject level the program does provide a valid test of both the bilinear and residual components.

To perform the bilinearity test for a given subject, the linear polynomial coefficients (i.e., $l_i = \overline{R}_{i.} - \overline{R}_{..}$ and $l_j = \overline{R}_{.j} - \overline{R}_{..}$) must be derived. The sum of squares for the bilinear component for that subject is computed to be the following:

$$SS_{\text{Bilinear}} = \frac{(\Sigma\Sigma\, l_i l_j \overline{T}_{ij})^2\, n}{\Sigma\Sigma\, (l_i l_j)^2}$$

where $\overline{T}_{ij}$ is the mean of the n scores in each design cell and the sums are over all cells of the design. The SS_{Residual} (on one less than the interaction degrees of freedom) is calculated from the difference between the $SS_{\text{Interaction}}$ and SS_{Bilinear}. The within-cell variability (the MS_{Error} from the ANOVA on the given subject's data) is used as the error term for both tests.

Each subject's data was analyzed separately by POLYLIN and by an ANOVA to test the fit of the model. Since the individual tests were based on only two responses per design cell, they had very low power. Therefore, an alpha level of .10 was used as the criterion of statistical significance, except when evaluating the residual interactions. Since the experimental hypothesis was that the residual interactions would be nonsignificant, a higher alpha level was used for the residual tests (α = .20).

Table 11 presents the frequency and percentage of subjects whose data showed a significant bilinear component for the P X A interaction. Even a significant bilinear component does not provide support for the model unless the residual component is nonsignificant. Therefore, two categories are presented in Table 11. In the first category the bilinear component is significant and the residual is nonsignificant; in the second category both the bilinear and the residual components are significant.

Analysis of the individual subject data on the likelihood measure indicated that only 16.6% of the subjects produced statistically significant data supporting the hypothesized P X A bilinear component and nonsignificant residual. The desire and feeling measures had 8.3% and 16.9%, respectively, of the subjects' data supporting this hypothesis.

Analysis of the P X B interaction at the individual level was also conducted. Table 12 presents a breakdown of subjects into the same two categories as Table 11, but for the P X B interaction. Only a small percentage of the subjects' data showed a significant P X B bilinear component and nonsignificant residual, 8.3%, 5.0% and 11.8% for the likelihood, desire and feeling measures, respectively.

It was also hypothesized that (averaging over the levels of P) the effects of the A and B components of the model would be additive, i.e., an ANOVA should indicate no significant A X B interaction. For the likelihood measure, the data of 20 subjects (33.3%) showed some evidence of an A X B interaction, i.e., either (a) the bilinear component was significant or (b) the overall interaction was significant, even though the bilinear component was not significant. (See Table 13.) For the desire and feeling measures, the data of 21 (35.0%) and 17 (28.8%), respectively, revealed some evidence of an A X B interaction.

Table 11

Frequency and Percentage of Subjects with a Significant Bilinear Component for the P X A Interaction

Dependent Measure	Bilinear Significant/ Residual Nonsignificant	Bilinear Significant/ Residual Significant
Likelihood Measure	10 (16.6%) N = 60	4 (6.6%) N = 60
Desire Measure	5 (8.3%) N = 60	1 (1.6%) N = 60
Feeling Measure	10 (16.9%) N = 59	0 (0%) N = 59

Note. N equals the number of subjects in the analysis. For the feeling measure, one subject was excluded since he responded identically in all cells of the design.

Table 12

Frequency and Percentage of Subjects with a Significant Bilinear Component for the P X B Interaction

Dependent Measure	Bilinear Significant/ Residual Nonsignificant	Bilinear Significant/ Residual Significant
Likelihood Measure	5 (8.3%) N = 60	1 (1.6%) N = 60
Desire Measure	3 (8.3%) N = 60	3 (5.0%) N = 60
Feeling Measure	7 (11.8%) N = 59	1 (1.6%) N = 59

Note. N equals the number of subjects in the analysis. For the feeling measure, one subject was excluded since he responded identically in all cells of the design.

Table 13

Frequency and Percentage of Subjects
Who Showed Evidence of
an A X B Interaction

Dependent Measure	Bilinear Significant/ Residual Significant or Nonsignificant	Overall Interaction Significant/Bilinear Nonsignificant
Likelihood Measure	15 (25.0%) N = 60	5 (8.3%) N = 60
Desire Measure	15 (25%) N = 60	6 (10%) N = 60
Feeling Measure	12 (20.3%) N = 59	5 (8.5%) N = 59

Note. N equals the number of subjects in the analysis. For the feeling measure, one subject was excluded since he responded identically in all cells of the design.

Clearly, the data of only a small number of subjects lent support to the hypothesized interactions. In fact, the data of many subjects showed no evidence of any statistically significant interactions among the three factors A, P and B. The percentage of subjects whose ANOVA tables showed only significant main effects (one or more) was calculated. On the likelihood, desire and feeling measures, 41.6%, 36.6% and 52.5% of the subjects' data, respectively, revealed only significant main effects. Again, these results should be interpreted cautiously since they are based on design cells containing only two responses each.

Ancillary Measures

Several measures were included to help interpret the data should significant effects of I (the factor which instructed subjects about the set of characteristics favored by the interviewer) be found in the overall analysis of the major dependent variables. Since factor I was not significant in the overall analysis, the ancillary measures are of only minor interest.

Following the final replication of the scenario study, subjects were asked to rate their own behavior in a work related situation in terms of the extent to which they (a) get along well with others and support superiors' opinions and policies and (b) express their own opinions and are exceptionally confident of their skills in handling the job. The responses were analyzed using the sex of the subject and I, the characteristics they were told the interviewer favored (i.e., whether the interviewer favored people who get along well with others and support superiors versus those who express their own opinions and are confident

of their skills) as the factors of the completely randomized factorial design. No significant effects of Sex, or I were found (either multivariately or univariately) on the subjects' ratings of their own behavior in a work related situation.

Subjects were also asked to evaluate in general, a person who is characterized as (a) someone who gets along well with others and supports superiors' opinions and policies and (b) someone who expresses his/her own opinions and is extremely confident of his/her skills in handling the job. Subjects made two ratings for the two sets of characteristics. The ratings were made on scales from zero to 100, with endpoints labeled extremely negative/extremely positive and extremely undesirable/extremely desirable. For each set, the average of the two ratings was calculated and the two derived measures were submitted to a multivariate analysis of variance (MANOVA). The results, based on Wilk's criterion, indicated a significant multivariate effect of Sex X I, $F(2, 55) = 3.78$, $p < .03$. Since the Sex X I effect was significant multivariately, univariate F ratios for this effect were examined on both derived measures. These analyses revealed a significant Sex X I effect, $F(1, 56) = 6.95$, $p < .01$, on the derived measure which asked subjects to evaluate someone who gets along well with others and supports superiors.

A comparison of the Sex X I interaction means was performed using Tukey's Honest Significant Difference Test, with the criterion of significance set at $\alpha = .01$. The results of the test indicated that none of the means differed significantly from each other. The means were as follows: $I_1S_1 = 70.87$, $I_1S_2 = 86.57$, $I_2S_1 = 80.67$ and $I_2S_2 = 76.57$ (where I_1 represents the condition where subjects were told that the interviewer favors people who express their own opinions and are confident of their

skills and I_2 represents the condition where the interviewer favors people who get along well with others and support superiors' opinions and policies; S_1 and S_2 represent groups of male and female subjects, respectively).

Since the factors, Sex and I, did not produce any consistent effects on the major dependent measures (the likelihood, desire and feeling measures), they do not aid in the interpretation of the findings of this study. Therefore, they will not be further discussed.

CHAPTER IV
DISCUSSION

Evidence from this experiment demonstrated that subjects' decisions about claiming an image were influenced by the stimulus information corresponding to the components of the proposed model. In terms of support for qualitative predictions, the perspective fared well. However, the quantitative analysis based on the information integration approach indicated that the precise data pattern did not fit the model.

Unfortunately, the interpretation of data that fail to fit a model is usually in doubt. Model discrepancies may, of course, reflect actual shortcomings of the model itself. They can also reflect factors such as floor and ceiling effects, number preferences, and/or inattentiveness which could produce nonlinearity in the response scale and cause discrepancies from the predictions of the model. Such discrepancies, produced by extraneous response tendencies that are not accounted for by the model, can be very problematic in quantitative tests (much more so than for qualitative directional predictions). Therefore, caution is necessary in their interpretation. Model discrepancies must be evaluated in light of accumulated knowledge in the area of research.

The following interpretation of the data for the likelihood measure is discussed in terms of both the qualitative findings (which provided some support for the model) and the quantitative findings (which indicated the model failed the test of fit). Possible reasons for the failure of fit are suggested.

A number of qualitative predictions can be made on the basis of the proposed model. For example, the overall value of claiming an image should increase if the following changes in the value of any one of the model's components occur (while holding the value of the other components constant). These changes include (a) increasing the expected value of a successful claim, (b) increasing the probability of a successful claim or (c) decreasing the expected value of an unsuccessful claim. The results of this study strongly supported these predictions.

The examination of the graph of the P X A interaction provided some support for the hypothesis concerning the multiplication of probabilities and expected values. The model predicts that if P (the probability of a successful claim) multiplies A (the expected value of a successful claim), then the effects of P should be (a) least when A is not positive and (b) greatest when A is very positive. The results indicated that prediction (a) received strong support. However, prediction (b) was only partially supported; the difference between the effect of P when A was very positive and its effect when A was only moderately positive was small.

The model further implies that if 1 - P (the probability of an unsuccessful claim) multiplies B (the expected value of an unsuccessful claim), then the effect of 1 - P should be (a) greatest when B is very negative and (b) least when B is not negative. Prediction (a) was definitely supported, while (b) received only minor support. Contrary to predictions, the results suggested that the difference between the effect of 1 - P when B was moderately negative and its effect when B was not negative was negligible. However, 1 - P did have a much greater effect when B was very negative than it did when B was either moderately negative or not negative.

According to the relative weighting scheme implied by the model, if subjects inferred 1 - P from the given P value, then the effects of B at the levels of P should be inversely related to the effects of A at the levels of P (i.e., the ordering of the magnitude of the slopes for the P X B interaction should be opposite that for the P X A interaction). This prediction also received partial support. Graphs of the P X A and P X B interactions did suggest that when the probability of a successful claim (P) was high, the effect of A (the expected value of a successful claim) was greatest, but the effect of B (the expected value of an unsuccessful claim) was least. At the lower probability levels the ordering of the slopes was less clear.

Finally, predictions based on the model imply that the effects of A and B (averaged over levels of P) should be additive. Thus, the graph of the A X B interaction should display parallel curves. This prediction was not supported. The effect of varying A was less when B was very negative.

Many past studies have relied solely upon qualitative evidence to provide support for or against a theoretical perspective. Overall, it is apparent that the use of a qualitative approach provides some evidence in support of the proposed perspective. However, the information integration approach based on functional measurement methodology goes beyond qualitative predictions concerning the ordering of the means or which effects should be greatest or least under different conditions. Model analysis based on this methodology specifies a fairly exact data pattern that must be obtained for a model to fit. Therefore, a few deviant data points can cause a model to fail a test of fit.

Based on the stringent quantitative analysis, the proposed model did not pass the test of fit. Although the overall P X A and P X B inter-

actions were statistically significant on the likelihood measure, the breakdown of these interactions into their respective bilinear and residual components indicated that the bilinear interaction was significant for the P X A interaction only if the significance level was set at alpha equals .05; it was not significant for the P X B interaction. The residual test for the P X A interaction (as calculated) was problematic, but implied that the residual was significant. While graphs of the P X A and P X B interactions showed that most of the predicted (qualitative) effects were present, the predicted linear fanning patterns were much less than true multiplication would predict.

It is quite surprising that the multiplication of the probability of a successful claim and the expected value of a successful claim received only weak support from the model analysis. Psychological research using the information integration approach has consistently supported the hypothesis that the subjective probability (that a particular choice will lead to an outcome) combines multiplicatively with the utility of that choice to influence the overall evaluation of the specific behavioral alternative. For example, studies have investigated the evaluation of gambles where the outcome (payoff) and probability of winning the payoff were varied in a factorial design. The results of these studies have shown a bilinear (multiplicative) data pattern for the predicted Probability X Payoff interaction (e.g., Anderson & Shanteau, 1970; Shanteau, 1974).

Studies outside the gambling domain have also supported the hypothesis that probability multiplies utility. For example, Lynch and Cohen (1978) found that the probability and (negative) utility of a

consequence of not helping in a hypothetical emergency combined multiplicatively to affect evaluations of the behavior of not helping.

Given the support for the general form of SEU-derived models, it is puzzling that the predicted interactions did not display true bilinear data patterns. One possible difference from past studies that might account for the failure is that the present study's stimuli were considerably more complex than those of most studies using the information integration approach. Typically, studies using the approach manipulate the factors of a model with much shorter scenarios, often with several stimuli being manipulated in a single paragraph. For the present experiment the stimulus information was presented in somewhat lengthy scenarios, which were intended to allow impressionistic evaluations. However, subjects may have found the amount of information hard to combine simultaneously, and this is necessary for a true multiplicative operation to occur. Thus, the possibility exists that under conditions where subjects do not have too much information to integrate, they utilize more complex rules than when there is a great deal of information.

It is also possible that the weak support for the predicted interactions stems from the failure to be specific about the probabilities in the stimulus materials. A weak probability manipulation could wash out the multiplicative effects.

It is interesting that Lynch and Cohen (1978) found support for the multiplication of probability and utility using a similar probability manipulation, while the present study found only weak support. In both studies, probabilities were manipulated in scenarios by using the wording slim chance, 50-50 chance and excellent chance. However, in the present study the explicit probability information was only part of a rather

lengthy (in comparison) paragraph leading up to it. Therefore, the lengthy paragraphs may have obscured the differences in the qualitatively stated probability levels, decreasing the overall multiplicative effect. Alternatively, limitations in processing capacity may have led to some anchoring and adjustment or more configural processing, thereby decreasing the overall multiplicative effect.

As previously stated, the proposed model predicted that averaging over factor P, the effects of A and B should be additive, i.e., the effect of one stimulus factor should not depend on the level of the factor with which it is paired. Instead, a discrepant interaction was obtained which suggested that the effect of varying A (the expected value of a successful claim) was less when B (the expected value of an unsuccessful claim) was negative. This violation of the hypothesized additive operation could have two possible interpretations. The model (the integration function specifying additivity) could be wrong or the judgment function could be nonlinear (i.e., the function relating the subjective evaluation to the numerical ratings could be nonlinear).

Studies in such diverse areas as personality impression formation (Birnbaum, 1974a), the evaluation of gambles (Lynch 1979; Shanteau, 1974) and helping behavior (Lynch & Cohen, 1978) have reported violations of hypothesized additive models which suggest that the effect of varying one factor depends upon the negativity or extremity of the other factor. In these studies the interaction has been interpreted as stemming from the incorrect specification of the model.

Lynch and Cohen's (1978) study of helping behavior found violations of the SEU additivity assumption (i.e., that Probability X Utility

products combine additively). They suggested that the integration process underlying the evaluation of behavioral alternatives could be better described by a differential-weight averaging model, i.e.,

$$\text{Evaluation of Behavior} = \frac{\Sigma\, w_i(p_i u_i)}{\Sigma\, w_i}$$

where p_i is the subjective probability the i^{th} salient consequence will result from the behavior, u_i is the utility of that consequence and w_i is the weight of the i^{th} consequence in determining the overall evaluation of the behavior. According to the hypothesized model, the weight assigned to a given consequence (w_i) is a quadratic function of the value of the $p_i u_i$ products. (Also see Anderson, 1970.) The proposed approximate representation for the hypothesis was as follows:

$$w_i = a\,(p_i u_i) + b\,(p_i u_i)^2 + c.$$

The constant $\underline{a}$ was hypothesized to be negative, representing the tendency to weight a consequence as a function of its negativity. The constant $\underline{b}$ was proposed to be positive, representing the tendency to weight extreme consequences more heavily than neutral consequences. The constant $\underline{c}$ can be arbitrarily set equal to 1.0, fixing the scale for weight. Thus, the empirically determined constants $\underline{a}$, $\underline{b}$ and $\underline{c}$ were hypothesized to represent the tendency to weight a consequence as a function of its negativity and/or extremity.

The interpretation stated above, that negative and/or extreme consequences are given more weight, assumes that the judgment function (J) relating the subjective evaluation (r) and the numerical responses (R) is linear. In the Lynch and Cohen (1978) study, monotonic rescaling removed the discrepant interaction while retaining the bilinear (multiplicative) form of the Probability X Utility interaction. Thus, it was unclear

whether the additivity violation of the SEU model was actually due to an inappropriate model of the integration process or to nonlinearity of the judgment function.

Lynch (1979) conducted an experiment to determine whether the violations of additivity for SEU-type models were attributable to shortcomings in the model or to nonlinearity in the relationship between numerical ratings and their subjective evaluations. He had subjects perform two tasks using the same experimental stimuli. In one task (the utility judgment task), subjects rated the subjective value of hypothetical bets. In the second task (the preference judgment task), they made pairwise comparisons of the same bets using preference judgments. The use of the same experimental stimuli in the two tasks allowed for the testing of alternative models of utility judgments (i.e., a constant-weight averaging model versus a differential-weight averaging model) through the criterion of scale convergence (Birnbaum & Veit, 1974).

The technique of scale convergence provides a criterion for deciding whether a given monotonic transformation is an appropriate account of the functional form of $J^{-1}(R)$, the function that when applied to the numerical ratings yields accurate values of the subjective evaluations. If the subjective scale values corresponding to the experimental stimuli (e.g., probabilities and utilities) are independent of the tasks in which they are employed, and if the different tasks involve the same dimension of judgment, then an appropriate model of the integration task must allow a single set of scale values to be derived. These scale values are the ones that reproduce the data from the different tasks when used as input for the hypothesized models. Thus, if a model applied to one task produces scale values that converge with those derived from a different

task, then that model is supported by the criterion of scale convergence. This approach is based upon the logic of converging operations (Garner, Hake & Eriksen, 1956).

The results of the Lynch (1979) study supported the notion that the additivity assumption of SEU-type models should be replaced by a differential-weight averaging rule. When the weighted averaging model was applied to the utility judgment data, the estimated scale values converged with those derived from applying a subtractive model of preference (assumed to be correct) to the preference data. Thus, the violation of the SEU additivity assumption was attributed to the incorrect specification of the model, rather than nonlinearity of the judgment function.

These findings have implications for the present research. They suggest that the divergent A X B interaction found in the present study is not due to a nonlinear judgment function, but represents a differential-weight averaging process. Therefore, it is suggested that the model of this study be revised to allow for differential-weighting of negative and extreme outcomes.

In terms of support for the multiplicative aspects of the model, the results were equivocable. Qualitative findings provided weak support for the model's predictions that the probability of a successful claim multiplies the expected value of a successful claim and that the probability of an unsuccessful claim multiplies the expected value of an unsuccessful claim. However, according to the stringent quantitative model analysis, the results did not support a true multiplicative pattern for probabilities and expected values.

Since this experiment was the first and only test of the proposed model, no definitive conclusions should be drawn without further experimentation. It is hoped that through conceptual replications and extensions, a better picture of the process of making self-presentational decisions will emerge.

APPENDICES

APPENDIX A
FUNCTIONAL MEASUREMENT OF MULTIPLYING MODELS

Consider a two-way factorial experiment where each subject receives stimulus combinations, P_i and A_j, and makes a numerical response, R_{ij}, to each combination. Suppose the subjective response is the product of the subjective values of the row and column stimuli, $r_{ij} = p_i a_j$, and the overt response is a linear function of the subjective response,

$$R_{ij} = \alpha\ (p_i a_i) + \beta \qquad (1)$$

(where α and β are linear coefficients). Then, it can be shown that the marginal means, $\overline{R_i.}$ and $\overline{R._j}$, are linear scales of the subjective values of the row and column stimuli, p_i and a_j, respectively. Furthermore, an appropriate factorial plot of the data will show a diverging linear fan pattern (i.e., a bilinear data pattern). In general, if either of the above premises is incorrect (i.e., the model is not multiplicative and/or the response is not a linear function of the implicit response), then the linear fan pattern will not be obtained.

To show that the row marginal means ($\overline{R_i.}$) would constitute linear scales of the subjective values of the row stimuli (p_i), let the number of columns for factor A equal J. Then, the mean of the J entries in row i is the expression

$$\overline{R_i}. = \frac{1}{J} \Sigma\ R_{ij} = \frac{1}{J} \Sigma\ (\ \alpha\ p_i a_j + \beta\ )$$

(where α and β are linear coefficients and the summation is over J columns).

For any value of i, p_i (the subjective row stimuli) is a constant, so

$$\overline{R_i}. = \frac{\alpha\ p_i}{J} \Sigma\ a_j + \frac{1}{J} \Sigma\ \beta = (\alpha\ \overline{a})\ p_i + \beta\ .$$

But, $(\alpha\ \overline{a})$ is also a constant, say α', so

$$\overline{R}_i. = \alpha'\ p_i + \beta\ .$$

This shows that the row marginal means are a linear function of the subjective row stimuli. Similarly, the column marginal means can be shown to be linear scales of the column stimuli,

$$\overline{R}._j = (\alpha\ \overline{p})\ a_j + \beta \quad . \tag{2}$$

Ignoring error variability, each row of data should plot as a straight line function of the column means. To see this divide both sides of Equation 2 by $(\alpha\ \overline{p})$. This yields the equation

$$\frac{\overline{R}._j}{\alpha\ \overline{p}} = a_j + \frac{\beta}{\alpha\ \overline{p}} \quad .$$

Isolating a_j gives

$$a_j = \frac{\overline{R}._j}{\alpha\ \overline{p}} - \frac{\beta}{\alpha\ \overline{p}} \quad .$$

Plugging the value for a_j into Equation 1 and simplifying, yields the expression

$$R_{ij} = \alpha\ p_i\ \left(\frac{\overline{R}._j}{\alpha\ \overline{p}} - \frac{\beta}{\alpha\ \overline{p}}\right) + \beta$$

$$= \left(\frac{p_i}{\overline{p}}\right) \overline{R}._j - \frac{p_i\ \beta}{\overline{p}} + \beta \quad .$$

Equation 3 shows that if the column means are used as the scale values of the column stimuli, then each row of data should plot as a fan of straight lines with a slope equal to $p_i \,/\, \bar{p}$ (except for sampling error). The intercept and slopes depend on i and, therefore, remain constant in each row. Equation 3 provides a simple graphical test of fit. Deviations from the implied form provide evidence against an hypothesized multiplying model.

The above results can be generalized to multiplicative operations of multilinear models. For example, consider a three-way factorial experiment where R_{ijk} is the numerical response to the stimulus combinations, P_i, A_j and B_k. If the cognitive integration process follows the integration model

$$\begin{aligned} r_{ijk} &= p_i a_j + (1 - p_i)\, b_k \\ &= p_i a_j + b_k - p_i b_k \end{aligned}$$

and the overt response is a linear function of the subjective response

$$R_{ijk} = \alpha\,[p_i a_j + b_k - p_i b_k] + \beta$$

then the marginal means of the two-way interaction tables estimate (provide functional values) of the subjective stimulus values.

To show that the A marginal means would constitute linear scales of the subjective values of the a_j stimuli, let I equal the number of rows and K equal the number of layers of the design. Then, the mean of factor A is

$$\begin{aligned} \bar{R}_{\cdot j \cdot} &= \frac{1}{I\,K} \sum^{I} \sum^{K} [\ \alpha\,(p_i a_j + b_k - p_i b_k) + \beta\ ] \\ &= \frac{\alpha}{I\,K} \sum^{I} \sum^{K} [p_i a_j + b_k - p_i b_k] + \frac{1}{I\,K} \sum^{I} \sum^{K} \beta \end{aligned}$$

$$= \frac{\alpha\ a_j}{I\ K} \sum^{I}\sum^{K} p_i + \frac{\alpha}{I\ K} \sum^{I}\sum^{K} b_k - \frac{\alpha}{I\ K} \sum^{I}\sum^{K} p_i b_k + \beta$$

$$= (\alpha \bar{p})\ a_j + (\alpha \bar{b} - \alpha\ \overline{pb} + \beta)\ .$$

Thus, the column marginal means for the three factor design form linear scales of the subjective column stimuli.

APPENDIX B
FUNCTIONAL MEASUREMENT OF ADDING MODELS

Consider a two-way factorial experiment. Suppose the subjective response is the sum of the subjective values of the row and column stimuli, $r_{ij} = a_i + b_j$, and the judgment function is linear so that

$$R_{ij} = \alpha\ (a_i + b_j) + \beta$$

(where α and β are linear coefficients). If the data are plotted as a function of the levels of factor B, with a separate curve for each level of factor A, then the curves should be parallel. Thus, observed parallelism provides support for an additive model. Furthermore, if the model holds and the judgment function is linear, then the row and column marginal means provide linear scales of the row and column subjective stimuli.

To show that the data will plot as a set of parallel curves, write the overt response for row 1 and row 2,

$$R_{1j} = \alpha\ (a_1 + b_j) + \beta$$

$$R_{2j} = \alpha\ (a_2 + b_j) + \beta\ .$$

Upon subtraction, the common terms, β and b_j cancel. Thus, the difference reduces to

$$R_{1j} - R_{2j} = \alpha\ (a_1 - a_2)\quad .$$

The expression on the right holds for every column j. Thus, the entries in row 1 and row 2 have a constant difference in every column, so the data will plot as parallel curves. The same holds for any other two

rows. Statistically, the model implies that the Row X Column interaction in the analysis of variance should be nonsignificant.

To show that the row marginal means, $\overline{R}_i.$, are linear scales of the subjective stimulus values, a_i, let n_j equal the number of columns for factor B. Then, the row marginal means are

$$\overline{R}_i. = \frac{1}{n_j} \Sigma \left[\alpha (a_i + b_j) + \beta \right]$$

$$= \frac{1}{n_j} (\Sigma \alpha \, a_i) + \frac{1}{n_j} (\Sigma \alpha \, b_j) + \beta$$

(where the summation is over all n_j columns). Thus,

$$\overline{R}_i. = \alpha \, a_i + \alpha \, \overline{b} + \beta$$

$$= (\alpha \, \overline{b} + \beta) + (\alpha) \, a_i$$

(where terms in parentheses are constants). Similarly, the column marginal means, $\overline{R}._j$, are linear scales of b_j,

$$\overline{R}._j = (\alpha \, \overline{a} + \beta) + (\alpha) \, b_j \quad .$$

APPENDIX C
ORAL INSTRUCTIONS

(Pass out written instructions.)

Please read these instructions carefully so that you understand them.

As the instructions stated, you are to imagine that you are an employee of a large business firm. You are being considered for a job promotion and must interview for the new job. You know that in the past the interviewer, the person making the promotional decision, has favored certain kinds of people over others. You recognize that you possess, at least to some extent, the characteristics the interviewer favors as well as those he opposes. You decide to emphasize strategically certain self-relevant facts you want the interviewer to know.

You are considering how to characterize yourself at the job interview. You have considered what you know about the interviewer, your qualities and what he knows about you. You believe that if you emphasize the qualities the interviewer is looking for and he believes you, then you have a good chance to get the job.

Before beginning the 27 scenarios, I'd like you to complete three scenarios for practice. Following each scenario, you will be asked three questions. For each question, please pick a number from zero to 100 that best represents your response. This is not a test, and one person's answers are no better or worse than another persons. I am interested in how you would react in certain situations and there are no right or wrong answers.

(Pass out practice scenarios.)

After completing the practice scenarios, you will have a better idea of what you are supposed to do. After you have completed them, if you have questions, please let me know.

(Pick up practice scenarios.)

These were for practice, and they will be thrown away.

(Pass out scenarios.)

As you go through the 27 scenarios, please give each one equal attention. They are all different, so read each one carefully. When you've finished, please check to make sure you have not missed any pages, then bring the booklet to my desk.

APPENDIX D
WRITTEN INSTRUCTIONS

Instructions (Form I-1)

This study is examining how people would respond to situations that commonly occur in everyday life. More specifically, we are interested in your reactions in a job interview situation. You are to imagine that you are an employee in a large business firm. You are being considered for a job promotion and you must interview for the new job. You know that in the past the interviewer, the person making the promotional decision, has favored people who get along well with others and support superiors' opinions and policies as opposed to people who express their own ideas and are exceptionally confident of their skills at handling the job. Furthermore, at the interview you will be asked to describe personal characteristics that make you right for the job. You decide to emphasize strategically certain self-relevant facts you want the interviewer to know.

You will read 27 scenarios that are similar except they differ in the kinds of information that is presented regarding the consequences that would result from emphasizing characteristics the interviewer is looking for and the probability that these consequences would occur. In a real life situation you would undoubtedly have much more information available to you than that provided in each scenario. However, for this task you are to assume that the information given is all that you know and that the descriptions represent your real beliefs about the situation. Please read each scenario carefully (each scenario is different). Consider each scenario as independent, i.e., think about only one scenario at a time.

After reading each scenario you will be asked to answer three questions. In answering the questions, you are to consider only the information in that scenario and assume this information represents your beliefs about the situation.

Before beginning the task you are to complete three practice scenarios. These practice scenarios were chosen from the 27 that are part of the study. They will give you an idea of the types of consequences that could occur from the job interview. Furthermore, they were chosen to represent the more extreme (either positive or negative) consequences that could occur.

Please reread these instructions to make sure you understand them.

Instructions (Form I-2)

This study is examining how people would respond to situations that commonly occur in everyday life. More specifically, we are interested in your reactions in a job interview situation. You are to imagine that you are an employee in a large business firm. You are being considered for a job promotion, and you must interview for the new job. You know that in the past the interviewer, the person making the promotional decision, has favored people who express their own ideas and are exceptionally confident of their skills at handling the job as opposed to people who get along well with others and support superiors' opinions and policies. Furthermore, at the interview you will be asked to describe personal characteristics that make you right for the job. You decide to emphasize strategically certain self-relevant facts you want the interviewer to know.

You will read 27 scenarios that are similar except they differ in the kinds of information that is presented regarding the consequences that would result from emphasizing characteristics the interviewer is looking for and the probability that these consequences would occur. In a real life situation you would undoubtedly have much more information available to you than that provided in each scenario. However, for this task, you are to assume that the information given is all that you know and that the descriptions represent your real beliefs about the situation. Please read each scenario carefully (each scenario is different). Consider each scenario as independent, i.e., think about only one scenario at a time.

After reading each scenario you will be asked to answer three questions. In answering the questions, you are to consider only the information in that scenario and assume this information represents your beliefs about the situation.

Before beginning the task you are to complete three practice scenarios. These practice scenarios were chosen from the 27 that are part of the study. They will give you an idea of the types of consequences that could occur from the job interview. Furthermore, they were chosen to represent the more extreme (either positive or negative) consequences that could occur.

Please reread these instructions to make sure you understand them.

APPENDIX E
SCENARIOS

Reactions to Interview Situations (Form I-1)

The following two paragraphs apply to all 27 scenarios. Please make sure you understand them. You may refer back to this page to refresh your memory.

You are to imagine that you are an employee in a large business firm. You are being considered for a job promotion and you must interview for the new job. You know that in the past the interviewer, the person making the promotional decision, has favored people who get along well with others and support superiors' opinions and policies as opposed to people who express their own ideas and are exceptionally confident of their skills at handling the job. Furthermore, at the interview you will be asked to describe personal characteristics that make you right for the job. You decide to emphasize strategically certain self-relevant facts you want the interviewer to know.

You are considering how to characterize yourself at the job interview. You've considered what you know about the interviewer, your qualities and what he knows about you. You believe that if you emphasize the qualities the interviewer is looking for (e.g., that you get along well with others and are willing to support superiors' opinions and policies) and he believes you, then you have a good chance to get the job.

Now, turn the page and begin.

EXAMPLE OF ONE SCENARIO

CONDITION: A = NOT POSITIVE, P = SLIM CHANCE, B = VERY NEGATIVE

The job means only a slight increase in salary, status and power. It also means much greater responsibility and extreme pressure. Furthermore, your family comes first and if you get the job it means working extra hours, a good deal of travel and giving up time with your family. The working conditions are also unpleasant as they require your sharing an office with a person you dislike. You believe the promotion will not allow you to advance further in the company. Considering everything you know, you believe that getting this job promotion is not very desirable.

You realize that emphasizing the qualities the interviewer is looking for does not mean that he'll believe you. Based on the situation, the interviewer's reputation for believing versus disbelieving what people say about themselves, and what the interviewer knows about you (e.g., your reputation, job record), you think that if you do emphasize these qualities, there is only a slim chance he'll believe you.

Furthermore, if he does not believe what you say about yourself, there is a good chance that the consequences would be very negative. Given what you know about him, he would probably view you as being very dishonest and have a very low opinion of you. His position in the company would allow him to influence future salary increases, give unpleasant job assignments and work hours and in general make your life miserable. He could even fire you.

1. How likely would it be for you to emphasize your ability to get along well with others and your support for superiors' opinions and policies?

   ____
   (0 = not at all likely & 100 = completely likely)

2. How much would you want to emphasize your ability to get along well with others and your support for superiors' opinions and policies?

   ____
   (0 = not at all & 100 = very much)

3. How good would you feel about emphasizing your ability to get along well with others and your support for superiors' opinions and policies?

   ____
   (0 = extremely bad & 100 = extremely good)

Twenty-seven scenarios were presented, reflecting all possible combinations of the informational stimuli manipulating the values of the A, P and B components of the model. The three levels of A were manipulated as follows:

a_1 = NOT POSITIVE

The job means only a slight increase in salary, status and power. It also means much greater responsibility and extreme pressure. Furthermore, your family comes first and if you get the job it means working extra hours, a good deal of travel and giving up time with your family. The working conditions are also unpleasant as they require your sharing an office with a person you dislike. You believe the promotion will not allow you to advance further in the company. Considering everything you know, you believe that getting this job promotion is not very desirable.

a_2 = MODERATELY POSITIVE

The job means only a moderate increase in salary, status and power. It also requires working extra hours and the pressure of greater responsibility. You also believe the promotion will put you in a position to advance further in the company, but not to the job you really want. Considering everything you know, you believe that getting this job promotion is only moderately desirable.

a_3 = VERY POSITIVE

The job means a large increase in salary, status and power. Although the job requires working extra hours and greater responsibility, you're looking forward to the challenge. You will also be given a private office, secretarial staff and unlimited use of a company car. You believe that with this promotion you will finally advance to the job you really want. Considering everything you know, you believe that getting this job promotion is very desirable.

The three levels of P were manipulated as follows:

p_1 = SLIM CHANCE

You realize that emphasizing the qualities the interviewer is looking for does not mean that he'll believe you. Based on the situation, the interviewer's reputation for believing versus disbelieving what people say about themselves, and what the interviewer knows about you (e.g., your reputation, job record), you think that if you do emphasize these qualities, there is only a slim chance he'll believe you.

p_2 = 50/50 CHANCE

You realize that emphasizing the qualities the interviewer is looking for does not mean that he'll believe you. Based on the situation, the interviewer's reputation for believing versus disbelieving what people say about themselves, and what the interviewer knows about you (e.g., your reputation, job record), you think that if you do emphasize these qualities, there is a 50/50 chance he'll believe you.

p_3 = EXCELLENT CHANCE

You realize that emphasizing the qualities the interviewer is looking for does not mean that he'll believe you. Based on the situation, the interviewer's reputation for believing versus disbelieving what people say about themselves, and what the interviewer knows about you (e.g., your reputation, job record), you think that if you do emphasize these qualities, there is an excellent chance he'll believe you.

The three levels of B were manipulated as follows:

b_1 = VERY NEGATIVE

Furthermore, if he does not believe what you say about yourself, there is a good chance that the consequences would be very negative. Given what you know about him, he would probably view you as being very dishonest and have a very low opinion of you. His position in the company would allow him to influence future salary increases, give unpleasant job assignments and work hours and in general make your life miserable. He could even fire you.

b_2 = MODERATELY NEGATIVE

Furthermore, if he does not believe what you say about yourself there is a good chance that the consequences would be only moderately negative. Given what you know about him, he might view you as slightly dishonest and lower his opinion of you. His position in the company might allow him to give you unpleasant work assignments, but he could not affect future salary increases or do anything to jeopardize your present position.

b_3 = NOT NEGATIVE

Furthermore, if he does not believe what you say about yourself, there is a good chance that the consequences would not really be negative. Given what you know about him, he would probably not view you as dishonest or lower his opinion of you. He would probably see you as a likeable individual who is just trying hard to get the job. At any rate, his position in the company gives him little power to influence your present position.

The scenarios following the Form I-2 cover page were identical to those of Form I-1. The three dependent measures following each scenario were changed to read as follows:

1. How likely would it be for you to emphasize that you express your own ideas and are confident of your skill at handling the job?

   ____
   (0 = not at all likely & 100 = completely likely)

2. How much would you want to emphasize that you express your own ideas and are confident of your skill at handling the job?

   ____
   (0 = not at all & 100 = very much)

3. How good would you feel about emphasizing that you express your own ideas and are confident of your skill at handling the job?

   ____
   (0 = extremely bad & 100 = extremely good)

APPENDIX F
FINAL QUESTIONNAIRE

Please rate your own behavior in a work related situation. The following questions are not related to the previous scenarios.

1. In work related situations (i.e., situations that are part of a job you would apply for), to what extent do you get along well with others and support superiors' (or someone with authority over you) opinions and policies?

   ____
   (0 = not at all & 100 = completely)

2. In work related situations (i.e., situations that are part of a job you would apply for), to what extent do you express your own opinions and feel exceptionally confident of your skills in handling the job?

   ____
   (0 = not at all & 100 = completely)

3. Divide 100 points between each of the three sets of characteristics, to represent the extent to which your behavior in a job related situation might be characterized by each.

   (A) You get along well with others and support superiors' opinions and policies

   (B) You express your own opinions and are exceptionally confident of your skills in handling the job

   (C) Neither A nor B is characteristic of you

For example, suppose you would be predominantly characterized as someone who gets along well with others, and support superiors' opinions and policies, and you would rarely be characterized as someone who expresses your own opinions and is exceptionally confident of your skills in handling the job. You might divide the 100 points as follows:
(A) = __80__, (B) = __20__, (C) = __0__.

Now, rate your behavior:

(A) = ________, (B) = ________, (C) = ________.

The last thing we would like you to do is to evaluate a person who possesses certain qualities.

How would you evaluate a person who is characterized as someone who gets along well with others and supports superiors' opinions and policies?

1. ___________
(0 = extremely negative & 100 = extremely positive)

2. ___________
(0 = extremely undesirable & 100 = extremely desirable)

How would you evaluate a person who is characterized as someone who expresses his/her own ideas and is exceptionally confident of his/her skill in handling a job?

1. ___________
(0 = extremely negative & 100 = extremely positive)

2. ___________
(0 = extremely undesirable & 100 = extremely desirable)

APPENDIX G
THE GEISSER-GREENHOUSE ANALYSIS

The statistical analysis of a repeated measures design operates under the assumption that the errors are independent and normally distributed with equal population treatment variances. Furthermore, homogeneity of the covariance between pairs of treatment levels is assumed. The homogeneity assumptions are satisfied if the variance-covariance matrix for each population treatment meets the condition of compound symmetry.

Although the *F* test is robust to violations of these assumptions for uncorrelated data (e.g., for completely randomized designs), violations of the homogeneity assumptions with repeated measures designs can seriously affect the interpretation of *F* ratios. When the homogeneity assumptions are violated, the conventional *F* test is biased in a positive direction (i.e., the critical values of the *F* distribution are too small, thereby indicating too many significant results). Unfortunately, most experiments in the behavioral sciences probably violate this assumption.

One way to deal with this problem is to perform the standard repeated measures analysis using different critical values, i.e., those that assume the presence of maximal heterogeneity. The Geisser-Greenhouse (1958) correction (assuming maximal heterogeneity) is made by dividing the original numerator and denominator degrees of freedom by a factor equal to the degrees of freedom associated with the repeated factors (see Keppel, 1973). The modified degrees of freedom are used to find the critical *F* values. This analysis is very conservative. It tends to overcorrect, biasing the *F* test in the negative direction.

Modified degrees of freedom (assuming maximal heterogeneity) were used to obtain new critical values for the F ratios in Table 1. The interpretation of the results, based on the conservative analysis, was identical to that of the original analysis, except that the interaction of A X B X P X I did not reach significance even at $\alpha = .05$. This interaction did reach significance in the original analysis (at $\alpha = .01$), although it appeared uninterpretable. Using the conservative analysis, one may be confident that the effects found to be significant in Table 1 (with the exception of the A X B X P X I interaction which is in doubt) would also be significant with an exact test.

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BIOGRAPHICAL SKETCH

Nancy McCown Burnap was born in Leesburg, Florida, May 7, 1952. She received a Bachelor of Arts degree in psychology from the University of Florida in 1975. In December, 1978, she was awarded a Master of Arts degree from the University of Florida. She is married to Dr. Charles A. Burnap and is currently residing in Charlotte, North Carolina.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Barry R. Schlenker, Chairman
Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Marvin E. Shaw
Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Franz R. Epting
Professor of Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

John G. Lynch, Jr.
Assistant Professor of Marketing

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

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December, 1982

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